

REPORT

OF THE

Indian Tariff Board

ON THE

SUGAR INDUSTRY



DELHI: MANAGER OF PUBLICATIONS
1938

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PRELIMINARY.

1. The enquiry into the Sugar Industry was referred to the Tariff Board under the Resolution of the Government Terms of Reference, of India in the Department of Commerce, No. 127-T. (1)/37, dated the 27th March, 1937, which runs as follows:—

“ The amount of protection afforded to the Sugar Industry by the duties imposed by section 2 of the Sugar Industry Protection Act, 1932, will determine on the 31st March, 1938, and section 3 of that Act provides that the Governor General in Council shall cause to be made by such persons as he may appoint in this behalf an enquiry to ascertain if the protection of the Sugar Industry during the period from 31st March, 1938, to the 31st March, 1946, should be continued to the same extent or to a greater or lesser extent. The Government of India have decided that this enquiry should be undertaken by the Tariff Board and the following terms of reference have been framed for its guidance:—

- (a) The Board is requested to examine the measure of protection now enjoyed by the Sugar Industry and to report whether it is necessary to continue protection to this extent or to a greater or lesser extent.
- (b) In making its recommendations the Tariff Board will take all relevant considerations into account including that stated in part (b) of the Resolution adopted by the Legislative Assembly on the 16th February, 1923.

2. Firms and persons interested in the Sugar Industry or industries dependent on the use of sugar who desire that their views should be considered by the Tariff Board should address their representations to the Secretary of the Board.”

2. The Board entered upon its duties at the beginning of April Board's Communi- and issued a press communiqué dated the 5th April, 1937, in the following terms:—

“ In the Government of India, Department of Commerce, Resolution No. 127-T. (1)/37, dated the 27th March, 1937, the Tariff Board has been directed to hold an enquiry to ascertain if the protection afforded to the Sugar Industry by the duties imposed by section 2 of the Sugar Industry Protection Act, 1932, should be continued to the same extent or to a greater or lesser extent during the period from the 31st March, 1938, to the 31st March, 1946. Those Associations, firms or persons interested in the Sugar Industry or industries dependent upon sugar who desire that their views should be considered by the Board are requested to forward their representations not later than the 1st May, 1937.”

3. As the working season of sugar factories was rapidly drawing to a close, it was found advisable to proceed forthwith on tour

Board's preliminary tour.

in the main sugar producing areas in order to study factory problems under working conditions and in particular the arrangements for the purchase, transport and delivery of sugarcane. This preliminary survey of the industry and informal discussions with officials and non-officials were of great assistance in framing the general and special questionnaires which were issued to Provincial Governments, Indian States, Chambers of Commerce and other Associations, manufacturers, merchants and representatives of cane growers.

4. During the enquiry conducted by the previous Tariff Board the case for the adoption of the policy of discriminating protection

Presentation of case for the continuance of protection.

for the Sugar Industry was presented mainly by the Imperial Council of Agricultural Research and four provincial Governments. On the present occasion the Council have tendered no evidence but supplied us with such statistical and technical information as they were in a position to give without expressing definite opinions on particular points. We regret that we have not had the advantage of a formal expression of their views on the important agricultural questions which it has been necessary for us to consider, more especially the cost of cultivation and the fair price of cane.

The case for the Sugar Industry has been presented by the Sugar Mills Association who deputed Sir. T. Vijayaraghavachariar, C.B.E., to watch their interests during the course of our enquiry and supply us with such information as we required. Sir T. Vijayaraghavachariar's long experience, especially in his capacity as Vice-Chairman of the Imperial Council of Agricultural Research, has been of material assistance to us in our examination of the case, particularly in its agricultural aspects.

5. Replies to our questionnaires were received from all Provincial Governments, 11 Indian States, 29 Associations and 90

Questionnaires.

individuals. Apart from the general representation of the Indian Sugar Mills Association 128 out of 159 factories or refineries have sent individual replies and supplied us with figures of production, cost of manufacture, stocks, etc. We desire to express our appreciation of the assistance we have received from officials and non-officials who have taken considerable trouble to supply us with the facts and figures we required.

6. In July the Board again proceeded on tour partly for the purpose of recording evidence but partly also to visit areas not covered in the first tour and to study the

Board's second tour.

conditions of sugarcane cultivation. Starting from Madras we proceeded in succession to Mysore, Bombay, Hyderabad, Delhi, the Punjab, the United Provinces, Bihar, Orissa and concluded our tour in

Bengal. In the course of our tours we have inspected 32 factories and refineries and 15 agricultural stations. We have also made a point, wherever possible, of inspecting sugarcane cultivation and holding impromptu conversations with the actual cultivators in their fields. We have recorded evidence from 25 witnesses and taken notes of informal discussions with 77 other persons which have been of assistance to us on points of detail.

7. The terms of reference by the Government of India might appear to restrict the scope of our enquiry to narrower limits than the enquiry conducted by the previous Tariff Board. Unlike the previous Tariff Board we are not called upon to discuss the desirability of protection for the Sugar Industry, but only the extent of such protection. The benefits to India from the policy of discriminating protection for the Sugar Industry have in recent years been set forth at length in many publications which, so far as we are aware, stand unchallenged. But the rapidity with which this policy has proved effective beyond the expectation of the most sanguine in freeing India from dependence on foreign supplies of sugar to the point now reached of self-sufficiency in internal production has given rise to new problems and difficulties which could not be foreseen. We have therefore found it necessary to discuss some aspects of the case in considerably more detail than the previous Tariff Board.

8. Beginning with a general survey of the world sugar position and the progress of the industry in India, we have dealt in turn with raw material, manufacture, marketing and consumption. The interests of the grower of sugarcane, the manufacturer, the merchant and the consumer are often different and sometimes conflicting; we have endeavoured to assess the relative importance of the respective interests from the point of view of the measure of protection required. The statistical tables contained in our report are based on official publications or information supplied by the Imperial Council of Agricultural Research, the Director of the Imperial Institute of Sugar Technology, Cawnpore, or the Director General of Commercial Intelligence and Statistics. In some cases we have been able to check the figures by independent calculations based on information gathered during the course of our enquiry. Where necessary, we have appended explanatory notes.

9. Other questions incidental to the main enquiry but intrinsically of considerable importance have received our consideration such as the relation between the Sugar and the "Gur" Industry, the by-products of sugar manufacture, subsidiary industries, labour conditions and State assistance to the industry. For convenience of reference we have followed generally the main lines of the previous Tariff Board's report, but a slightly different arrangement of the material has been found necessary to suit the scope of our terms of reference. Many of the conclusions

at which the previous Tariff Board arrived still hold good and we have not found it necessary to repeat some of the information it supplied. The statistics in our report are in continuation of those furnished in the previous report and begin generally from the year 1930-31.

For facility of reference we have, where necessary, converted foreign currencies into rupees, annas and pies (1 rupee = 16 annas: 1 anna = 12 pies). Throughout our report the term maund is to be taken to mean the standard maund of $82\frac{2}{7}$ pounds.

10. We desire to express our appreciation of the help received from our Secretary, Mr. K. B. Bhatia, I.C.S., from Rai Sahib

Acknowledgments. H. C. Sen, from Mr. Amritlal Sahgal, B.A., LL.B., A.C.A., R.A., and from the other members of our staff.

Report

on the

Sugar Industry.

CHAPTER I.

The World Position.

1. Like the last Tariff Board on sugar, we propose to begin by a brief survey of the Sugar Industry throughout the world. This will, we hope, make for a better appreciation of the position in India.
2. The following are the figures of world production for the last seven years:—

TABLE I.—*Estimate of the world sugar production by Dr. Gustav Mikusch—Campaign year September to August.*

(In 1,000 metric tons raw sugar value.)

	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.*
A.—BEET SUGAR.						
<i>(a) Europe.</i>						
Germany	1,596	1,091	1,428	1,673	1,676	1,800
Danzig	22	22	26	33	..	8
Czechoslovakia	814	634	517	638	571	725
Austria	163	105	170	223	206	145
Hungary	125	103	136	120	117	137
France	874	1,022	946	1,223	924	910
Belgium	205	265	247	269	241	245
Netherlands	172	240	290	243	236	245
Poland	403	417	342	447	444	460
Denmark	122	192	254	90	245	220
Sweden	144	235	305	272	205	305
Italy	363	319	300	345	321	328
Spain	402	260	242	349	198	250
Jugoslavia	83	85	74	63	90	98

* Figures for the year 1936-37 have been taken from Dr. Gustav Mikusch's forecast of the world sugar production, Facts about Sugar, February 1937.

TABLE I—*contd.*

	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.*
A.—BEET SUGAR—<i>contd.</i>						
<i>(a) Europe—contd.</i>						
Roumania	48	53	145	107	135	74
Bulgaria	26	29	45	2	18	10
Switzerland	6	7	9	10	8	9
United Kingdom	231	373	523	694	510	548
Irish Free State	6	27	35	75	89	97
Finland	4	6	7	12	9	11
Latvia	10	27	33	61	50	40
Lithuania	7	31	9	17	24	29
Turkey (European and Asiatic)	16	18	78	66	60	72
Azores	3	3	3	3	3	3
Soviet Union	1,689	796	1,460	1,460	2,612	2,000
<i>(b) America.</i>						
United States	1,175	1,363	1,648	1,178	1,188	1,300
Canada	54	67	66	57	60	62
Argentina . . . . .	..	4	4	4	5	3
Uruguay	1	1	1	1	3	3
<i>(c) Australia.</i>						
Victoria (Maffra)	6	6	6	6	5	6
<i>(d) Asia.</i>						
Japan (Hokkaido)	27	27	26	39	34	62
Manchuria	2	5	4	4	5	5
Turkey (Anatolia)	10	12	..	..	..	..
Iran . . . . .	..	3	1	9	17	20
China . . . . .	..	..	..	..	1	1
TOTAL BEET SUGAR PRODUCTION.	8,952	7,896	9,124	9,701	10,439	10,231
B.—CANE SUGAR.						
<i>(a) Europe.</i>						
Spain	21	19	15	18	19	15
<i>(b) America.</i>						
Louisiana and Florida	166	240	232	245	345	342
Porto Rico	900	757	1,010	710†	843†	885†
Hawaii	933	943	860	877	852	950
Virgin Islands	4	4	5	..	..	..
Cuba	2,678	2,053	2,340	2,611	2,003	2,900
Trinidad	99	123	107	120	157	150
Barbados	85	94	81	47	107	100
Jamaica	64	56	74	78	93	96

* Figures for the year 1936-37 have been taken from Dr. Gustav Mikusch's forecast of the world sugar production, Facts about Sugar, February 1937.

† Figures marked with † include figures for Virgin Islands also.

TABLE I—*concl'd.*

	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.*
B—CANE SUGAR—<i>cont'd.</i>						
<i>(b) America—cont'd.</i>						
Antigua, St. Kitts, St. Lucia and St. Vincent.	46	55	57	56	61	61
Martinique and Guadeloupe .	91	96	85	92	92	92
Dominion Republic and Haiti .	457	580	414	467	495	446
Mexico	262	190	209	285	331	330
Guatemala, Costa Rica, Hon- duras, Nicaragua, San Salva- dor and Panama.	66	48	41	44	48	58
<i>(c) South America.</i>						
British Guiana	128	151	144	134	181	185
Dutch Guiana	25	18	18	17	18	18
Argentina	346	348	316	342	386	431
Brazil	975	930	969	994	1,034	916
Peru	409	410	420	383	389	400
Venezuela, Colombia, Ecuador, Bolivia and Paraguay.	92	90	93	74	73	74
<i>(d) Asia</i>						
British India	3,521	4,174	3,106	3,228	3,696	3,825
Java	3,004	2,760	1,504	701	564	610
Japanese Empire	1,154	797	802	1,156	1,088	1,190
Philippine Islands	990	1,152	1,434	630	902	985
China, Indo-China	262	270	264	423	451	455
<i>(e) Africa.</i>						
Egypt	147	170	154	152	147	160
Mauritius	167	251	265	183	285	250
Reunion	43	54	77	64	91	60
South African Union . . .	296	326	355	325	379	605
Mozambique	71	93	68	84	66	72
Angola, Madeira, Madagascar, Kenya, Uganda, Somaliland, Belgian Congo and Cape Verde.	56	58	77	89	102	107
<i>(f) Australia.</i>						
Queensland and New South Wales.	615	541	677	653	657	715
Fiji Islands	73	139	118	115	134	153
TOTAL CANE SUGAR PRODUCTION.	18,256	17,823	16,397	15,397	16,689	17,517
WORLD SUGAR PRODUCTION	27,208	25,719	25,521	25,188	27,128	27,748

* Figures for the year 1936-37 have been taken from Dr. Gustav Mikusch forecast of the world sugar production (Facts about Sugar, February, 1937)

A perusal of Table I reveals certain very interesting facts. The production of sugar is spread throughout the world and roughly two-thirds of it is from cane in tropical and sub-tropical countries and one-third from beet in countries situated in the temperate zone. Taking both beet and cane together there was a decline from 1932-33 to 1934-35, but since then the total production of sugar has increased although the proportion of beet sugar to cane sugar has recently fallen. The tendency to produce more sugar is largely the result of a world-wide policy of State assistance to sugar production.

3. The Report of the United Kingdom Sugar Industry Inquiry Committee of 1935 mentions the use of many methods of State assistance either singly or in combination.

Tariffs.

The following may be noted:—

- (a) The complete reservation of the internal market by the prohibition of imports (*e.g.*, Australia).
- (b) Protective tariffs. This method is almost universal in European countries and is also employed in the United States of America and its dependencies, British India, Japan and other countries as well as the United Kingdom.
- (c) Tariff preference enjoyed in countries other than the country of production (*e.g.*, the preferences enjoyed by Colonies in the United Kingdom and by Cuba in the United States of America).
- (d) Direct subsidy (*e.g.*, in the United Kingdom, the Irish Free State and the Netherlands).
- (e) Other differential advantages (*e.g.*, the rebate of trade taxes as in Czechoslovakia).

4. The import duties levied in the principal countries of the world are given below:—

Tariffs.

THE WORLD POSITION.

TABLE II.—*Import Duties in the Principal Countries in the World.*
(Supplied by the Imperial Institute of Sugar Technology, India.)

Exchange rates.	Countries.	General duty.			Preferential duties. Uncertificated.			Dominion Colonial Certificated.			Excise duty.
		s.	d.		s.	d.		s.	d.		
	Great Britain—										
	Sugar of polarization exceeding—										
	99°	11	8		5	10		2	4	7	4 7 (Rs. 2-3-11)
	98° and not exceeding 99°	11	8		4	9		1	6	3	3 7-1 (Rs. 1-12-2)
	97° and not exceeding 98°	8	7		4	7		1	5	8	3 6 (Rs. 1-11-5)
	95° and not exceeding 96°	8	1		4	4		1	4	8	3 3-8 (Rs. 1-10-4)

NOTE.—Assistance afforded to the farmers is included in the best price paid by the factories which was based on sugar contents. The actual rate of assistance to the factories is related to a price for raw sugar in the open market of 4s. 6d. per cwt.

TABLE II—*contd.*

Exchange rates.	Countries.	Rates of duty—in cents per lb.			
		Raw—96° polarization.		Refined.	
		Full duty.	Cuban duty.	Full duty.	Cuban duty.
4.00 dollars = £1.	United States— According to the latest Federal Legislative Act, September, 1934	1.875 (Rs. 4.3.2)	.90 (Rs. 2.0.3)	1.9875 (Rs. 4.7.2)	.954 (Rs. 2.2.2)
NOTE.—Hawaiian sugars have been admitted to the United States free of duty since 1876.					
17 yen = £1.	Japan—	Rate of import duty (Yen per 100 kin.).			
	I. (a) Under No. 11 Dutch Standard	. . . . .	. . . . .	2.50 (Rs. 1.3.3)	
	(b) Under No. 22 Dutch Standard	. . . . .	. . . . .	3.95 (Rs. 1.14.6)	
	(c) Other	. . . . .	. . . . .	5.30 (Rs. 2.8.10)	
	(d) Rock candy sugar, cube sugar, loaf sugar and similar sugars	. . . . .	. . . . .	7.40 (Rs. 3.9.1)	
II. No conventional tariff for sugar in Japan exists. III. Excise duty varies from 90 sen to 9.50 yen per 100 kin. IV. Rebate amounting to not more than the amount of sugar excise duty is allowed to those who export confectionery or cube in which sugar is included.					

Raw Sugar (100 Kg.).

Exchange rates.	Country.	Import duties. Original currency.		Consumption taxes to be paid for imported sugar. Original currency.		Total charge imposed by duties and taxes. Original currency.	
		Sugar.		Sugar.		Sugar.	
		Raw.	Refined.	Raw.	Refined.	Raw.	Refined.
12-18 marks =£1.	Germany	Reichs mark.		Reichs mark.		Reichs mark.	
		27 (Rs. 11-0-0)	32 (Rs. 13-1-2)	21 (Rs. 8-9-3)	21 (Rs. 8-9-3)	48 Rs. (19-9-9)	53 (Rs. 21-10-5)
106-35 F. F.	France	Paper francs.		Paper francs.		Paper francs.	
		165-75 (Rs. 7-12-1)	170 (Rs. 7-15-2)	85 (Rs. 3-15-7)	85 (Rs. 3-15-7)	250-75 (Rs. 11-11-8)	255 (Rs. 11-14-9)
68 guilders =Rs. 100.	Holland	Guilders.		Guilders.		Guilders.	
		..	2-40 (Re. 1-5-1)	27 (Rs. 14-13-1)	33-75 (Rs. 18-8-4)	27 (Rs. 14-13-1)	36-15 (Rs. 19-13-5)
99-02 lire =£1.	Italy	Paper lire.		Paper lire.		Paper lire.	
		110-10 (Rs. 5-14-3)	165-15 (Rs. 8-13-4)	364 (Rs. 19-7-6)	380 (Rs. 20-5-3)	474-10 (Rs. 25-5-9)	545-15 (Rs. 29-2-7)
Russia	Russia	<i>Ad valorem.</i>		<i>Ad valorem.</i>		<i>Ad valorem.</i>	
		80 per cent.	150 per cent.	85-87 per cent.	83-86 per cent.	..	..

CHAPTER I.

Raw Sugar (100 Kg.)— contd.

—	—	Rates of duty. Gold units (per 100 kilos).
1 gold unit = 32½d.	China—	
	Sugar—	
	95° and not exceeding 96°	8.10 (Rs. 5-7-4)
	96° and not exceeding 97°	8.40 (Rs. 5-10-7)
	97° and not exceeding 98°	8.80 (Rs. 5-14-10)
	Exceeding 98°	9.60 (Rs. 6-7-6)

NOTE.—The figures in brackets show the corresponding rates in Rupees per maund of sugar calculated on the basis of the present exchange rates shown in column (1).

THE WORLD POSITION.

5. We give below two Tables showing the total consumption and the *per capita* consumption in some of the principal countries of the world.

TABLE III.—*Consumption of sugar in the world by Dr. Gustav Mikusch, Vienna, in 1,000 metric tons—raw value.*

	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
<i>Europe—</i>						
Germany	1,657	1,497	1,503	1,530	1,573	1,68½
Czechoslovakia . . .	401	396	399	401	409	410
Austria	196	200	172	175	169	174
Hungary	114	93	88	93	96	103
Switzerland	183	183	172	195	180	152
France	1,089	1,018	1,060	1,045	1,081	1,091
Belgium	227	232	226	229	235	245
Netherlands	268	325	333	305	303	313
United Kingdom . . .	2,268	2,184	2,109	2,244	2,283	2,343
Poland	372	332	315	324	335	383
Soviet Union	1,600*	1,500*	960	1,160*	1,380*	2,000*
Denmark	193	197	195	204	196	212
Sweden	267	265	260	282	282	309
Italy	369	336	319	325	328	362
Spain	297	315	296	302	300	307
Other Countries . . .	876	807	779	845	819	874
TOTAL EUROPE . . .	10,371	9,880	9,186	9,659	9,969	10,967
<i>Asia—</i>						
China and Hongkong † .	830	605	600	595	790	850*
British India	4,580	4,229	4,640	3,372	3,564	3,983*
Japan and Formosa † . .	868	967	948	975	1,114	1,200*
Java	431	402	399	353	334	312
Philippine Islands . . .	70	52	61	70	65	65*
Other Countries	579	493†	469	512	564*	583*
TOTAL ASIA	7,358	6,748	7,117	5,877	6,431	6,993
<i>Africa—</i>						
Egypt	200	108	113	127	149	160
South African Union . . .	173	173	169	181	200	197
Mauritius	10	10*	11	11	11	11
Other Countries	440	381	400	401	424	433*
TOTAL AFRICA	823	672	693	720	784	801

* Estimated.

† Calendar years.

TABLE III—*contd.*

	1930-31	1931-32.	1932-33.	1933-34	1934-35.	1935-36
<i>America—</i>						
United States	6,052	5,935	5,890	5,099	5,905	6,020
Hawaii	20	20	22	22	22	24
Porto Rico, Virgin Islands .	50	50	53	60	53	60
Cuba†	145	150*	152	150	158	154*
Canada, Newfoundland .	454	436†	427	461	480	500*
British West Indies Guiana†.	47	44*	45	48	44	46*
French West India . . .	5	5	23	5	5	5*
Haiti, Dominion Republic† .	29	28	211	34	33	33*
Mexico	211	189	44*	240	255	283
Central America . . .	103	53*	357	47	55	56
Argentina†	365	345	925*	342	370	370
Brazil	825	840*	63	935*	897	911
Peru	60	60	5*	66	72	73†
Other countries in South America.	392	228	230	250	261	276*
TOTAL AMERICA	8,668	8,383	8,461	8,359	8,610	8,817
<i>Australia Continent . . .</i>	<i>320</i>	<i>333</i>	<i>339</i>	<i>343</i>	<i>357</i>	<i>365*</i>
<i>Oceania</i>	<i>85†</i>	<i>84*</i>	<i>80</i>	<i>79</i>	<i>87</i>	<i>83*</i>
TOTAL AUSTRALIA . . .	405	417	419	422	444	453
WORLD	27,625	26,100	25,876	25,037	26,247	28,031

* Estimated.

† Calendar years.

‡ Other Countries.

TABLE IV.—*Consumption per capita.*

Countries.	Kilos per head.	Pounds per head.
<i>European Countries—</i>		
Denmark	55.9	123.3
Great Britain	47.8	105.1
Irish Free States	38.7	85.3
Belgium	28.3	62.1
Netherlands	25.3	55.8
France	25.1	55.3
Czechoslovakia	24.2	53.3
Germany	23.4	51.6
U. S. S. R.	13.6	30.0
Poland	10.9	24.0
Portugal	8.2	18.1
Italy	7.9	17.4
Turkey	4.6	10.1

TABLE IV—*contd.*

Countries.	Kilos per head.	Pounds per head.
<i>Countries outside Europe—</i>		
New Zealand	55.0	121.3
Australia	48.0	105.3
U. S. A.	43.0	94.3
Canada	40.2	88.6
Cuba	38.6	85.1
Argentina	31.3	69.0
Union of South Africa	23.1	50.9
Brazil	20.2	44.5
Philippine Islands	19.0	41.9
Japan	11.2	24.7
Java	4.5	9.9
India	2.9	6.5

(The International Sugar Journal, May, 1937, page 169.)

There is no country in which sugar is not consumed although the *per capita* consumption differs from one country to another. It is interesting to observe that *per capita* consumption is as high as 123.3 lbs. in Denmark and 105.4 lbs. in Great Britain and as low as 24.7 lbs. in Japan, 9.9 lbs. in Java and 6.5 lbs. in India. But it must be remembered that in Java and India there is a considerable consumption of gur which is to some extent a substitute for sugar. For purposes of comparison of consumption with production the world may be divided into three parts:—

- (a) Countries which consume sugar but produce none within their own territories. They are few and relatively unimportant. Norway and Greece are examples.
- (b) Countries which produce sugar but do not produce enough to meet their entire demands and have to import. These include the United Kingdom and the United States of America.
- (c) Countries which produce more sugar than they consume and have a surplus for export. Among them are Cuba, Germany and Java.

6. The first two categories of countries in the preceding paragraph constitute what is known as the 'free market', i.e., a market in which tariff is not high enough to be prohibitive and it is possible to sell foreign sugar. India is included in the 'free market' though actually her production is at least equal to consumption. In 1930-31 the 'free market' for sugar amounted to 6,000,000 tons. To-day it has shrunk to 3,000,000 tons or about 10 per cent. of the world output, the remaining 90 per cent. being markets closely protected in the interest of domestic producers.

7. The following are the figures of stocks on the 31st August in selected countries as given by Messrs. F. O. Licht:—

TABLE V.—*Stocks on 31st August in selected countries as given by Messrs. F. O. Licht.*

(Thousands of metric tons—Raw value.)

	1930-31.	1931-32	1932-33	1933-34.	1934-35.	1935-36.	1936-37.
Germany . .	743	746	345	257	371	361	331
Czechoslovakia . .	313	212	136	91	99	100	71
Austria . .	30	7	14	9	64	92	59
Hungary . .	47	27	40	29	28	27	26
France . .	308	219	241	263	392	323	201
Belgium . .	85	66	57	53	66	63	48
Netherlands . .	112	101	97	102	82	85	87
United Kingdom	218	212	317	252	291	196	231
Poland . .	261	177	172	98	105	89	76
Italy . .	269	260	212	267	269	209	161
Spain . .	86	196	171	140	200	129	70
Sweden . .	117	95	98	135	125	120	110
TOTAL EUROPE .	2,592	2,318	1,900	1,666	2,092	1,785	1,494
Canada . .	88	95	97	101	105	109	105
United States . .	838	644	670	1,168	932	789	800
Cuba . .	2,610	2,365	2,008	1,761	4,339	1,092	1,170
Java . .	1,978	2,916	2,976	2,373	1,577	904	836
Argentina . .	405	383	369	397	375	417	403
TOTAL OTHER COUNTRIES.	5,919	6,403	6,120	5,800	7,348	3,311	3,314
TOTAL .	8,511	8,721	8,020	7,466	9,440	5,096	4,808

8. Below we give a table showing the World prices. retail price in selected countries:—

TABLE VI.—*Retail Prices.**

	Per kilo. Pence.	Per lb. Pies.
<i>European Countries—</i>		
Denmark 43 ore, i.e., about	4.60	22.25
Belgium 2.85 Belgian francs about	4.70	22.74
Great Britain	5.00	24.19
Irish Free State	7.60	36.77
France 3.35 French francs about	7.60	36.77

(The International Sugar Journal. May. 1937, page 170.)

TABLE VI—*contd*

	Per kilo. Pence.	Per lb. Pies.
<i>European Countries—contd.</i>		
Portugal 4·20 esc. about	9·20	44·51
Poland 1 zl. about	9·80	45·00
Turkey 25 piastres about	9·80	47·42
Czechoslovakia 6·20 cr. about . .	10·60	51·29
Netherlands 0·47 gulden about . .	12·60	60·96
Germany 0·76 R. M. about	15·00	72·56
Italy 6·15 lire about	15·90	76·92
U. S. S. R. 3·80 roubles about . .	37·20	179·96
<i>Countries Outside Europe—</i>		
Cuba 0·044 cents, <i>i.e.</i> , about . . .	2·20	10·64
Java	2·66	12·87
Brazil	3·30	15·97
Japan 0·3375 yen about	4·70	22·74
Philippine Islands 0·20 cents about .	4·90	23·71
Argentina 0·35 cents about	5·20	25·16
Canada 10·8 cents about	5·20	25·16
U. S. A. 10·8 cents about	5·30	25·64
New Zealand	7·70	37·26
Union of South Africa	7·70	37·26
Australia	8·80	42·58
India	8·98	19·00

The retail prices of sugar show a wide variation in different countries. It is interesting to compare the prices in Java and India which were 12·87 pies and 19·00 pies per lb. respectively.

9. By 1931 the surplus of export sugar amounted approximately to one third of the annual world production, and, to check this growing disparity between production

and consumption, an international agreement known as the Chadbourne Agreement was signed in May, 1931. The Agreement was intended to secure joint restriction of exports and production with a view to liquidating existing stocks within five years. The plan lasted until 1935, but failed to raise the world sugar prices because the sacrifices made by the parties to the Agreement, particularly Java and Cuba, (other signatories were Germany, Czechoslovakia, Poland, Belgium, Hungary, Peru and Yugoslavia) were nullified by the increase of production in countries outside the Agreement, particularly the United States and the United Kingdom including its colonies and India. On the termination of the plan the representatives of the 'Chadbourne' countries suggested to the United Kingdom the convening of a World Sugar Conference, since the British Empire constituted the largest sugar producing area.

10. The International Sugar Conference concluded in London on 6th May, 1937, a comprehensive agreement for the regulation of world prices and production. Regulation is to be effected by means of export quotas and

general undertakings which comprise (1) prevention of excess production in the event of a rise in prices in the free market, (2) adoption, as an object of national policy, of a reduction in the disproportionate fiscal burdens on sugar, (3) action to increase consumption and (4) promotion of reciprocal agreements. The agreement is to run for five years, beginning from September 1, 1937, and will be enforced by an International Sugar Council with headquarters in London whose duty will be to study questions relating to all aspects of the Sugar Industry. The Statistical Committee of the International Sugar Conference prepared the following estimate of the sugar requirements of the free world market which formed the basis for the establishment of export quotas in the regulatory plan:—

Free Market Requirements, 1936-37.

	Thousands of metric tons.
<i>United Kingdom and Canada—</i>	
Consumption, United Kingdom	2,405
Consumption, Canada	506
	2,911
Home and preferential sugars available	2,208
	<hr/>
Free market requirements	703
<i>Europe—</i>	
Finland	119
France and Colonies	225
Greece	79
Irish Free State	31
Norway	84
Spain	50
Switzerland	152
Other countries	64
<i>America—</i>	
United States	24
Chille	135
Uruguay	47
Other countries	63
<i>Africa—</i>	
Total	105
<i>Asia—</i>	
Afghanistan	30
Arabia	16
Asiatic Russia	10
British India	50
British North Borneo, Sarawak	8
Ceylon	37
China, Hongkong, Manchuko	530
Federated Malay States and Straits Settlements	126
Iran	70

Free Market Requirements, 1936-37—contd.

	Thousands of metric tons.
<i>Asia—contd.</i>	
Iraq . . .	39
Palestine . .	26
Siam . . .	53
Syria . . .	31
<i>Oceania—</i>	
Total . . .	94
Non-statistical consumption	119
GRAND TOTAL . .	3,170

(Facts about Sugar, May, 1937, page 170.)

The export quotas assigned to the various countries under the Agreement are as follows:—

Base quotas.

	Metric tons.	
Java . . .	1,050,000	(exclusive of exports to Holland).
Cuba . . .	940,000	
San Domingo . .	400,000	
Peru . . .	330,000	
Czechoslovakia . .	250,000	
Soviet Union . . .	230,000	(excluding exports to Mongolia, Tanatura and Sinkiang).
Germany . . .	120,000	
Poland . . .	120,000	
Brazil . . .	60,000	
Hungary . . .	40,000	
Haiti . . .	32,000	
Mozambique . . .	30,000	
Belgium . . .	20,000	
Reserve . . .	47,500	(10,000 assigned to Yugoslavia and 37,500 to France and Colonies).

3,670,000

Among the non-exporting countries the United States will continue to import from the free market at least in the same proportions as at present. The United Kingdom will limit home production to 618,000 metric tons, and exports from the Colonies to 965,254 metric tons. Australia is given an export limit of 406,423 tons and South Africa one of 209,000 tons. India will prohibit seaborne exports to places other than Burma. China will endeavour to see that her imports do not decrease and if possible increase.

It will be seen that the export quotas allowed (3,670,000 tons) are in excess of the free market requirements (3,170,000 tons) by half a million tons. The curtailment of exports agreed upon is thus insufficient and the prospects of improvement in world prices depend on the success with which the free market can be stimulated to consume another half a million tons annually and the exporting countries scale down their exports.

A study of the foregoing statistics also shows that some countries have been allotted quotas in excess of what would appear necessary on the basis of their present exports. It seems to us a matter for regret that the exports from the cheaper cane producing countries like Cuba, Java and Brazil should generally have been reduced and exports from the comparatively expensive beet producing countries should have been increased, but it was probably the price which the latter were able to demand and which had to be paid for a restriction of total supplies to the free market.

CHAPTER II.

Sugar Industry in India.

11. The question of protection for the Sugar Industry in India may be taken to have become an issue of practical importance with the appointment of the Tariff Board in 1930.

Protection to the Sugar Industry. The Board found that the industry had substantially fulfilled the conditions laid down by the Fiscal Commission. In recommending protection for a period of not less than 15 years, the Board emphasised strongly the agricultural aspect of the case and the national importance of promoting the cultivation of sugarcane.

12 In the year 1930 the maximum duty on imported sugar was Rs. 6 per cwt. with a lower range of duties for inferior qualities and a duty of 25 per cent. *ad valorem* on molasses. In 1931, the revenue duty was twice raised, first in April to a maximum of Rs. 7-4-0 per cwt. and later in September to a maximum of Rs. 9-1-0 per cwt. with a duty of 31½ per cent. *ad valorem* on molasses. In April 1932, following the report of the Tariff Board, these revenue duties were converted into a protective duty of Rs. 7-4-0 per cwt. with a revenue surcharge of Rs. 1-13-0 per cwt. and applied, without any gradation, to sugar of all standards and sugarcandy (excluding confectionery), the duty on molasses remaining 31½ per cent. *ad valorem*. In February 1934 sugarcandy was separated from sugar for purposes of duty and a revenue duty of Rs. 10-8-0 per cwt. imposed. In April 1934, an excise duty of Rs. 1-5-0 per cwt. was levied on sugar manufactured by the vacuum pan process and 10 annas a cwt. on khandsari sugar and simultaneously the protective duty was raised to Rs. 7-12-0 per cwt. with an additional duty of Rs. 1-5-0 equal to the excise duty, the total import duty thus remaining at Rs. 9-1-0 per cwt. as before. On 27th February, 1937, the excise duty was further raised by 11 annas to Rs. 2 per cwt. for vacuum pan process sugar and by 11 annas for khandsari sugar to Rs. 1-5-0 per cwt. which was subsequently reduced to Re. 1. Simultaneously the protective duty was reduced to Rs. 7-4-0 per cwt., and the additional duty raised to Rs. 2 thus increasing the total import duty by 3 annas to Rs. 9-4-0 per cwt., the duty on molasses remaining at 31½ per cent. *ad valorem* as before.

13. As a result of the policy of discriminating protection, it is no overstatement to say that the Sugar Industry in India has been revolutionised. From a country mainly dependent on imports of sugar, India has become the largest sugar producing country in the world with an output equal to, if not in excess of, its requirements. The statistics in the following Table illustrate the progress made in the last seven years since the date of the last Tariff Board report:—

Results of protection.

TABLE VII.

Year.	Acreage under cane.	Acreage under improved varieties of cane.	Yield of cane.	Yield per acre.	Number of		Total.	Production of sugar by			Total production of sugar (November to October)	Net imports of sugar by sea into British India and Kathiawar States (November to October).	Total production and imports (November to October).	Average wholesale price of sugar per maund (November to October)	
					Vacuum pan factories working.	Sugar refineries working.		Vacuum pan factories (November to October).	Refineries (November to October).	Khandasari and open pan processes (November to October).				Imported	Indian.
	In thou- sands.	In thou- sands.	In lakhs of tons.	In ton- s.				Tons in thou- sands.	Tons in thou- sands.	Tons in thou- sands.			Tons in thou- sands.	B. A. P.	R. A. P.
1930-31 . . .	2,905	817	356	12.3	29	10	39	120	36	200	350	808,688	1,119	9 2 6	8 13 9
1931-32 . . .	3,077	1,170	435	14.1	32	17	49	140	62	230	471	331,786	1,003	10 13 6	9 6 7
1932-33 . . .	3,425	1,846	502	14.6	57	27	84	290	78	275	643	384,813	1,028	10 9 3	8 19 11
1933-34 . . .	3,422	2,293	518	15.1	112	16	128	414	65	200	719	320,404	1,030	10 0 7	8 8 3
1934-35 . . .	3,602	2,446	544	15.1	130	13	143	578	43	150	771	311,448	1,082	9 12 11	8 10 7
1935-36 . . .	4,134	3,071	628	15.2	177	11	180	922	48	125	1,105	121,704	1,238	9 10 10	8 2 10
1936-37 . . .	4,573	3,341	714	15.0	140	9	149	1,130	25	100	1,254	24,000	1,270	9 14 5	9 9 2

14. These figures speak for themselves; we add, however, a few explanatory comments. In 1917-18, the area under sugarcane in India was approximately 3 million acres and during the next fifteen years fluctuated round this figure without material alteration. It was not till 1933-34 that as a result of the policy of protection any considerable expansion in acreage occurred. During 1935-36 and 1936-37 the figures exceeded 4 million acres but fell to 3,855,000 acres in 1937-38.

15. Concurrently with the expansion of cultivation there has occurred an equally marked improvement in the quality of cane. The acreage under improved varieties of cane has increased from 817,000 acres in 1930-31 to 3,341,000 in 1936-37 and the average yield per acre from 12·3 to 15·6 tons. The supply of improved varieties of cane is now generally adequate for the requirements of factories, but this should not be taken to imply that the limit of improvement in quality has yet been reached or is even in sight.

16. It will be observed that the increase in the number of vacuum pan factories was most rapid in the period immediately succeeding the grant of protection to the industry. In comparison with 1932-33, the number of factories was almost doubled in 1933-34 but since 1934-35, the year in which an excise duty was first levied, the tendency has been towards the extension of plants in existing factories rather than to the opening of new factories.

17. In the case of refineries, the number in operation increased from 10 in 1930-31 to 27 in 1932-33. Since that year this branch of the industry has steadily declined owing to the competition of vacuum pan factories and by 1936-37 the number of refineries working had fallen to 9. For the same reason the production of sugar by khandsaris and open pan concerns has been adversely affected. During the last five years the proportion of sugar manufactured by vacuum pan factories has risen from 45 per cent. to 86 per cent. while the proportion of sugar produced by refineries has fallen from 12 per cent. to 3 per cent. and by other processes from 43 per cent. to 11 per cent.

18. As regards imports the immediate effect of the new revenue duty and surcharge imposed in 1931 was to bring down the total by almost half. Since then the quantity has continued to decline, and by 1936-37 net imports had fallen to the insignificant figure of 22,000 tons with no signs of recovery in 1937-38.

19. In the matter of prices the effect of the protection has not been entirely in accordance with expectation. The average price of imported sugar rose sharply in 1931-32 and continued above Rs. 10 per maund until

1934-35 when it fell to below Rs. 10. The price of Indian factory sugar rose in 1931-32 to over Rs. 9 per maund but again fell below Rs. 9 in 1932-33. In 1934-35 in consequence of the imposition of the excise duty the price was slightly increased but the rise did not continue long. In 1935-36 the average price was Rs. 8-3-0 but in 1936-37 a slump in the market brought down the level to Rs. 6-9-0. The additional excise duty imposed in February 1937 had only a slight and temporary effect on prices which after rising slightly in March again fell to even lower levels in the next three months.

The disparity in the prices of imported and Indian factory sugar which in 1931-32 was on the average about Rs. 1-6-0 per maund has widened with the fall in the price of Indian sugar and in 1936-37 was over Rs. 3 per maund. At this level imported sugar has ceased to compete in the ordinary market and commands a limited sale for special purposes only.

20. No picture of the Sugar Industry would be complete without some reference to gur (or jaggery as it is known in the south of India) which is to some extent a substitute for sugar as a sweetening ingredient in

Gur.

food and drink. In general, gur is made by boiling the juice of the sugarcane and after a limited amount of clarification solidifying it into a substance containing sugar and molasses; but in some parts of India, chiefly Madras and Bengal, juice tapped from the palmyra, date or cocoanut palm is the material used.

21. We pass next to a consideration of the lines of development of the industry in different parts of India. For purposes of comparison India may be divided into two

Territorial distribution of production.

tropical, comprising other Indian States.

fairly distinct regions—sub-tropical, comprising Northern and Central India, and Bombay, Hyderabad, Madras, Mysore and

22. The divergencies in climatic and other conditions affecting the cultivation of sugarcane are considerable not only as between

Divergencies in climatic and other conditions.

the sub-tropical and tropical regions but also as between different provinces and States within these regions. *Primâ facie* it might be expected that the tropical area in which conditions approximate to conditions in Java and the West Indies, would be the principal sugar producing area in India. Actually the reverse is the case, for no less than 91·85 per cent. of the total acreage under sugarcane is grown in the sub-tropical area and 8·15 per cent. only in the tropical, in spite of the fact that in the latter the yield per acre is higher and the quality superior. The reason for this is the comparatively high cost of cultivation in the tropical region. The rich alluvial soil of the Gangetic plain confers an initial advantage on the main sugar producing belt of the United Provinces and Bihar which at present outweighs the other natural advantages of the tropical region.

SUB-TROPICAL.

United Provinces.

23. The most important sugar producing region in India is the United Provinces. The area under sugarcane has increased during the seven years ending 1936-37 from 1,490,000 acres to 2,519,000 acres, more than four times the area in any other province, but the estimated acreage of 1937-38 is smaller. The main sugar producing tracts are the Western United Provinces comprising the Rohilkhand and Meerut Divisions, the Central comprising the Fyzabad and Lucknow Divisions and the Eastern consisting of the Gorakhpur Division. The South and South Eastern portion of the province comprising the Jhansi, Agra, Allahabad and Benares Divisions is, at present, relatively unimportant, but an extension of irrigation in parts of the Allahabad and Benares Divisions may ultimately lead to a considerable development of sugarcane cultivation.

The climate in the Western tract is hot and dry in summer and cold in winter with occasional frosts. The average rainfall ranges from 29 inches in the Meerut area to 41 inches in the Rohilkhand area except in some submontane areas where it is higher. The sugarcane crop is grown under irrigation mainly from the Jumna and Ganges canal systems but partly also from tube wells, the number of which has increased rapidly with the development of Hydro-electric schemes supplying electrical power at a cheap rate for pumping water.

In the Central tract the extremes of climate are somewhat less severe and the danger of damage to the sugarcane crop by frost smaller. The average rainfall is from 38 to 41 inches. The sugarcane crop is grown mainly under irrigation from the Sarda and other canal systems.

In the Eastern tract the climate is hot in summer but comparatively mild in winter. The average rainfall is 45 inches. Two-thirds of the sugarcane crop is classified as unirrigated and one-third as irrigated.

In the Western tract the average cost of cultivation per acre may be estimated at Rs. 110 for a yield of 18 tons, in the Central tract at Rs. 90 for a yield of 15 tons and in the Eastern tract at Rs. 75 for a yield of 13 tons respectively.

The number of vacuum pan factories has increased from 34 in 1932-33 to 74 in 1936-37 including 2 in Rampur State. A considerable quantity of sugar is still produced by processes other than the vacuum pan mainly in the Rohilkhand division, the original home of the khandsari sugar industry. But khandsari concerns have in recent years found increasing difficulty in competing with vacuum pan factories. By 1936-37 it is estimated roughly that one-third of the total number had closed down.

The United Provinces contain the oldest and largest sugarcane growing and the most important sugar manufacturing tracts in India. The original home of the sugarcane is believed to have

been the rich alluvial plain watered by the Ganges and Jumna rivers in Rohilkhand. Sugar has been manufactured by indigenous methods from a very early period. But in spite of the rapid increase in sugar production by modern processes, the percentage of sugarcane used in vacuum pan factories is still 20 only against 66 converted into gur. The distribution of factories in the main sugar producing belt is uneven. In some areas there is a definite congestion while in others there are few or no factories.

The production of sugar in 1936-37 is estimated at 609,000 tons of which 561,000 tons were exported outside the province. The *per capita* consumption of sugar is estimated at 5.6 lbs.

Bihar.

24. The area under sugarcane is reported to have increased during the seven years ending 1936-37 from 284,000 to 460,000 acres, but fell considerably in 1937-38. Acreage figures must, however, be taken with considerable reserve as most of the province is unsurveyed and the agency employed for the estimation of areas is inadequate.

The main sugar producing tracts are fairly distinct in character, North Bihar where the sugarcane crop is mainly unirrigated, and South Bihar where the crop is grown under irrigation. The average rainfall for the province is 48.4 inches and is higher in North than in South Bihar.

North Bihar comprises the Tirhut Division which adjoins the Gorakhpur Division of the United Provinces and is of almost equal importance as a sugar producing area, and the Bhagalpur Division where the area under sugarcane is comparatively small. The climate is hot in summer, but mild in winter and the sugarcane crop is not liable to damage by frost. The average rainfall in a normal season is adequate for the crop without irrigation for the prevalent type of soil which is light alluvium.

In South Bihar the area under sugarcane is less than half the area in North Bihar. The Patna Division is the important sugar producing area. The Chota Nagpur Division is of little importance. The type of soil is mainly heavy clay on which sugarcane requires irrigation. Canal irrigation charges are Rs. 12 per acre.

The standard variety of cane grown in the province is Co.213. Other varieties are Coimbatore 210 and 214 while new types more recently introduced are 299, 313 and 331. The crop is on the ground for 10 to 14 months.

The cost of cultivation may be estimated in North Bihar at Rs. 70 for a yield of 13 tons and in South Bihar at Rs. 80 for 14 tons.

The number of vacuum pan factories has increased from 18 in 1932-33 to 35 in 1936-37 of which 30 are located in North Bihar and 5 in South Bihar. Owing to the competition of vacuum pan factories open pan concerns have decreased from 29 to 7 in 1936-37. There is no khandsari sugar industry in the province.

Bihar is the second largest sugar manufacturing province in India. Conditions in North Bihar are on the whole similar to conditions in the eastern tract of the United Provinces but considerable quantities of cane are grown on large estates in substitution for the former indigo plantations. In parts of North Bihar there is some congestion of factories but in South Bihar they are spread out at wider distances from one another. The production of sugar in 1936-37 was 329,000 tons of which 200,000 tons were exported. *Per capita* consumption of sugar is put at 3·1 lbs.

Punjab.

25. The area under sugarcane has increased during the seven years ending 1936-37 from 426,000 to 551,000 acres. The province may be divided into three tracts, the Western, Central and Eastern. Rainfall varies in the three tracts from 10·1 inches to 31·55 inches. Irrigation is partly by canals and partly from wells. Water rate charges for canal irrigation are on the average Rs. 11 per acre. The cost of irrigation by wells is considerably higher. The main Coimbatore canes grown are Co.205, 213, 285 and 290. More recently introduced varieties are Co.312 and 313. Cost of cultivation may be estimated to range from Rs. 80 per acre for a yield of 12 tons under canal irrigation to Rs. 170 for 16 tons unirrigated.

In 1930-31 there was one vacuum pan factory in operation in the south eastern area of the Province. Following the adoption of the policy of discriminating protection, 8 new vacuum pan factories, including one in the Indian State of Kapurthala, and a considerable number of open pan concerns came into existence, but in spite of the advantage of a good market for sugar both in the province itself and in North-West Frontier Province, the industry as a whole has not been successful. Of the 9 vacuum pan factories 4 had practically closed down in 1936-37 and of the 5 which continued to work, one is to be removed to the United Provinces. The experience of open pan factories has been even more unfortunate and this branch of the industry has also completely come to an end. It may seem remarkable that though the Punjab is second only to the United Provinces in its production of sugarcane and is one of the most important sugar consuming provinces, the sugar manufacturing industry should have met with so little success. Its failure is attributed mainly to the circumstance that the climatic conditions of the Punjab are on the whole unfavourable to the production of cane of sufficient sucrose content to be suitable for the manufacture of sugar in competition with factories situated in the United Provinces and Bihar. The province is liable to frost which is sometimes severe enough to destroy the crop and to a greater or less extent affects the sucrose content of cane. The poor recovery of sugar also accounts for the closing down of gur refineries. Of the 16 refineries working in 1932-33 all but one had been closed by 1936-37 and this refinery has found it impossible to work on locally produced gur on account of the poor sucrose content.

In spite of the closure of factories and open pan concerns, sugarcane cultivation has continued to expand. It appears that in most areas gur manufacture is still able to hold its own. A peculiarity of the province is that comparatively large quantities of cane are used for chewing and are fed to cattle.

Sugar is imported to the extent of 239,000 tons. The estimated *per capita* consumption of sugar is 14·6 lbs., which is more than double the average consumption in India.

North-West Frontier Province.

26. The area under sugarcane has increased during the seven years ending 1936-37 from 47,000 acres to 72,000 acres. The normal rainfall in the Province is 15·07 inches. Sugarcane is grown under irrigation for which the charge is Rs. 10 per acre. The cost of cultivation is estimated at Rs. 120 per acre with an average yield of 18 tons per acre for improved varieties of cane.

The province is a gur producing area. There are no vacuum pan factories and the quantity of sugar produced by the open pan or khandsari method is now negligible.

Sugar is imported to the extent of 9,000 tons. The *per capita* consumption is estimated at 8·3 lbs.

Bengal.

27. The area under sugarcane has increased during the seven years ending 1936-37 from 198,500 to 354,800 acres but fell considerably in 1937-38. The principal sugarcane growing areas are situated in the Rajshahi, Dacca and Presidency Divisions.

The rainfall of Bengal ranges from 45 inches in the south-west to 130 inches in the north-east. The sugarcane crop is not irrigated as the rainfall is usually adequate and in some areas in excess of requirements. The main varieties of cane grown are Coimbatore 213 and yellow Tanna. The crop is on the ground from 10 to 18 months. The cost of cultivation may be estimated at Rs. 110 for a yield of 17 tons.

In Bengal jute is the principal cash crop and sugarcane only subsidiary. Attempts to restrict the area under jute and the low price of jute led to some increase in sugarcane cultivation, but a rise in the price of jute is likely to reduce the acreage.

There are 7 vacuum pan factories and 2 new factories are under construction. The number of open pan concerns has decreased in recent years, but some revival of the industry is considered possible by the adoption of a new and a more economical process of manufacture recently introduced.

A peculiarity of Bengal is the manufacture of gur and rab from the juice of the date palm to an estimated extent of 100,000 tons a year. Some part of the rab is converted into sugar by means of centrifugals.

Bengal imports sugar to the extent of 14,800 tons. The *per capita* consumption is estimated at 6·7 lbs.

Assam.

28. The area under sugarcane is estimated to have increased during the seven years ending 1936-37 from 29,500 to 36,800 acres. The normal rainfall of the province is 101 inches and is adequate for sugarcane cultivation without the assistance of irrigation. Improved varieties of cane are grown in about three-fourths of the total area planted. The average cost of cultivation may be estimated at Rs. 80 per acre for a yield of 12 tons.

One small vacuum pan factory and five open pan concerns have worked spasmodically, but the production of sugar has been inconsiderable.

Sugar is imported to the extent of 15,600 tons per annum. The *per capita* consumption is estimated at 3·5 lbs.

Orissa.

29. Orissa was constituted into a separate province in 1936. The area under sugarcane in 1936-37 is estimated at 31,000 acres. Conditions in North Orissa which was formerly part of Bihar differ to some extent from conditions in South Orissa which was formerly part of Madras. The average rainfall of the province is 57·4 inches. About two-thirds of the crop is irrigated and one-third unirrigated mainly in the area liable to inundation by floods. Improved varieties of cane chiefly of the Coimbatore thin type in North Orissa and of the thick type in South Orissa have taken the place of indigenous varieties. The crop is on the ground for 12 to 13 months. The cost of cultivation in North Orissa may be estimated at Rs. 85 for a yield of 18 tons, and in South Orissa at Rs. 200 for a yield of 26 tons. One small vacuum pan factory is located in South Orissa. Another factory will be ready to operate in 1937-38. There are no vacuum pan factories in North Orissa and only one open pan concern manufacturing sugar and gur.

Sugar is imported to the extent of 6,900 tons. The *per capita* consumption is estimated at 3·1 lbs.

Central Provinces.

30. The area under sugarcane has increased during the last seven years from 21,000 to 30,000 acres. Most of the cane is grown in the rice and wheat tracts in the east and north-east of the Province, and comparatively little in the western cotton tract. The normal rainfall is 42·3 inches. Most of the crop is grown under irrigation. Water rates for irrigation vary from Rs. 12 to Rs. 25 per acre. About half the sugarcane grown is of improved varieties. The cost of cultivation may be estimated at Rs. 125 for a yield of 16 tons. The Province is almost entirely a gur producing area. There are no vacuum pan factories and the quantity of sugar manufactured by the open pan method is inconsiderable.

The Province imports sugar to the extent of 41,000 tons. The *per capita* consumption of sugar is estimated at 5.1 lbs.

Other Provinces and States.

31. Other provinces and States which furnish separate statistics of sugarcane cultivation are Delhi 5,000 acres, Sind 5,000 acres, Bhopal 6,000 acres and Baroda 3,000 acres. One vacuum pan factory is operating in Sind and one in Baroda. A new factory is in course of erection in Bhopal. In Central India one vacuum pan factory is working in Jaora State and a new factory is projected in Bikaner.

TROPICAL.

Bombay.

32. The total acreage under sugarcane in Bombay (including Indian States) has increased during the seven years ending 1936-37 from 93,000 to 126,000 acres but fell in 1937-38. The province has three sugarcane growing tracts, the Deccan, the Karnatak and Gujerat, of which Deccan is the most important containing more than half the total area, and all the vacuum pan factories in operation. Though situated in the tropical region, the northernmost part of the Deccan tract is liable to occasional frost owing to the circumstance that the Deccan is a plateau with an elevation of from 1,600 to 1,800 feet. In most of the tract the normal rainfall is only 18 to 24 inches and irrigation is almost entirely from canals. Owing to the costliness of canal construction water rate charges for irrigation are exceptionally high in comparison with the charges in other provinces. On a basic rate of Rs. 28 for minor canals and Rs. 45 for major canals per annum the cost of irrigation increases according to the length of time beyond a year that the crop is standing on the ground and in the case of major canals may amount to over Rs. 60 per acre. In addition, in certain circumstances a drainage charge of Rs. 15 per acre is leviable. The sugarcane grown is of the thick (Noble) type. The main varieties are EK.28, POJ.2878 and Co.290. The crop usually takes from 12 to 14 months to reach maturity, but an eighteen month crop known as 'adsali' is also grown which is ready for harvesting early in October in order to lengthen the working season of factories.

Partly on account of the cost of irrigation and partly on account of the practice of heavy manuring the average cost of cultivation in the canal tract is as high as Rs. 400 an acre. For this outlay a yield of 40 to 42 tons an acre may be expected and with special manuring and intensive cultivation yields of over 100 tons per acre have been obtained.

The number of vacuum pan factories has increased from one in 1930-31 to eight in 1936-37 and one new factory is projected. Open pan concerns have found increasing difficulty in competing with vacuum pan factories and ten out of twelve have closed down.

Sugar production in Bombay has more than one peculiar feature. All factories but one themselves grow either the whole or the major portion of the cane they require for crushing and operate their own tramway systems for its transport. Each factory has its zone of operation and through their regulation of the conditions under which water is supplied and cane grown in the Deccan canal tract the Government exercise a measure of control over the erection of new factories.

Bombay is an importing province to the extent of 150,000 tons of sugar. The *per capita* consumption is estimated at 15.5 lbs.

Madras.

33. Taking the Province of Madras as at present constituted, the acreage under sugarcane has increased during the seven years ending 1936-37 from 102,000 to 122,000 acres. For purpose of comparison the Province may be divided into four tracts, the Northern, Central, Southern and Western. The Northern tract, comprising East Coast districts north of Madras, with an average rainfall of 47.4 inches, includes the rich delta of the Godavari and Kistna rivers and is on the whole the most advantageously situated for the cultivation of sugarcane. Five of the ten vacuum pan factories are located in this tract. In the Central tract, which includes the Deccan famine zone districts, the rainfall is often precarious and badly distributed and averages only 26.0 inches. Irrigation is mainly dependent on small tanks and channels. This tract has one medium sized factory and one small refinery which occasionally crushes cane. The Southern tract, comprising East Coast districts south of Madras, has an average rainfall of 35.2 inches. Irrigation is mainly from tanks and wells, but part of the area is commanded by the Cauvery-Mettur and Periyar Irrigation projects. The oldest established and largest factory in the Province is located in this tract. The Western tract, comprising two West Coast districts with an average rainfall of 134.2 inches, grows comparatively little cane. One small factory only is in operation.

In Madras, sugar factories are so scattered and conditions so different in different parts of the Province that general conclusions are difficult to draw and average figures may be misleading in respect of cultivation costs and yields per acre. Water rates for irrigation vary from Rs. 7 to Rs. 15 per acre.

The principal varieties of thick cane hitherto grown have been mainly of the Mauritius and Fiji types which are in course of replacement by new varieties from the Coimbatore Station such as Co.413, 419, 421 and P.O.J.2878. Cost of cultivation and yields per acre in the main factory areas vary from Rs. 150 for a yield of 20 tons to Rs. 300 for a yield of 35 tons. In the East Coast districts particularly liable to periodical cyclones, additional expenditure is incurred in propping the cane with bamboos to prevent lodging. The crop is normally on the ground for 10 to 12 months and occasionally for 15 months.

Of the 10 vacuum pan factories, three are small concerns crushing less than 150 tons and only one is of considerable size. Almost all cane is purchased by factories from small growers and difficulty has been experienced in obtaining sufficient quantities.

A peculiarity of Madras is the wide range of alternative cash crops—groundnuts, cotton, plantains, chillies and tobacco—to which the cultivator can turn apart from the staple food crop, paddy, for which the South Indian raiyat has a traditional predilection. The circumstance may partly account for the slow spread of sugarcane cultivation in the province in spite of its many natural advantages.

Another peculiarity of Madras is that in addition to gur manufactured from sugarcane, a considerable quantity (estimated at 30,500 tons) is made from the juice of the palmyra and other palms. Five concerns in Madras, and one in the adjoining area of the Travancore State, refine palm juice gur into sugar and sugar so manufactured is specially exempted from excise duty.

The net imports of sugar into the Province of Madras including the States of Cochin and Travancore is estimated at 67,000 tons. The *per capita* consumption is estimated at 2·8 lbs.

Mysore.

34. The acreage under sugarcane has increased during the seven years ending 1936-37 from 37,734 to 52,000 acres. Almost the whole of the State is a plateau at an elevation of 2,000 to 3,000 feet enjoying an equable climate. The sugarcane area may be divided into three tracts, the Maidan tract with an average rainfall of 30 inches irrigated mainly by tanks and wells, the Irwin Canal tract with an average rainfall of 30 inches irrigated by the Irwin Canal and the Malnad tract with an average rainfall of 100 inches. In the Irwin Canal tract in consequence of the opening of the canal in 1932, and the establishment of a sugar factory in 1934, the increase in sugarcane cultivation has been marked in comparison with the other two tracts which are entirely gur producing.

In the Irwin Canal tract the water rate charges are Rs. 10 per acre. The varieties of cane grown are mainly of the thick type evolved in the State Agricultural Farm at Hebbal near Bangalore of which HM.320, 544 and 602 are considered the best. The average cost of cultivation may be estimated at Rs. 175 per acre for a yield of 23 tons. The factory in this area has increased its capacity from 400 tons to 1,400 and again recently to 2,000 tons. Owing to natural advantages of climate and rainfall the crushing season can be prolonged to nine or ten months, the highest period in India.

Mysore exports sugar to the extent of 12,000 tons. The *per capita* consumption is estimated at 2·6 lbs.

Hyderabad.

35. The area under sugarcane has increased during the seven years ending 1936-37 from 34,478 to 57,951 acres. In the eastern half of the State, which is mainly a rice producing tract, irrigation is mainly from tanks. This tract includes the Nizamsagar irrigation project under which it is proposed to develop the cultivation of sugarcane in sufficient quantities to supply a large vacuum pan factory in course of erection. The western half of the State is mainly a cotton producing tract, but sugarcane is grown under wells to some extent, especially in the Bidar district. Rainfall in the State ranges from 28 inches to 50 inches. Sugarcane, which is an 11 to 12 months crop, is everywhere irrigated. Water rate charges are between Rs. 30 to Rs. 40 per acre in the principal sugar growing districts. The main improved varieties of cane are Co.213, 290 and POJ.2878. The cost of cultivation is estimated to be about Rs. 275 an acre for a yield of 750 maunds, but with the improvement in the variety of cane higher yields are expected in the factory area.

Hitherto the State has been an entirely gur producing area except for a few open pan concerns which have not proved successful. The new vacuum pan factory with a capacity of 1,000 tons is expected to be in full operation in 1938-39.

Sugar is imported to the extent of 18,000 tons. The *per capita* consumption is estimated at 2·6 lbs.

36. Though the United Provinces and Bihar have so far maintained their position as the chief sugar producing area with a combined production of 937,900 tons out of a total of 1,128,900 tons, developments in the industry in other parts of India are becoming of increasing importance. It is significant that of the 9 new factories under construction or projected, all but one will operate in areas outside the United Provinces and Bihar and 5 will be located in Indian States. Public opinion, it would appear, favours an increase of internal production in provinces which at present import most of their requirements from outside. A change in the territorial distribution of production which will work to the disadvantage of exporting areas is a new problem on the horizon, the repercussions of which are likely to prove important in the not distant future.

CHAPTER III.

Raw material (cane).

37. During the last seven years the area under sugarcane in India has increased from 2,905,000 to 4,573,000 acres. In the same period the yield of cane per acre is estimated to have risen from 12·3 to 15·6 tons owing mainly to the introduction of improved varieties of cane.

38. In 1936-37 the total production of sugarcane is estimated to have been 7,140,000 tons of which 69 per cent. was used for the manufacture of gur, 22 per cent. for the manufacture of sugar and 9 per cent. for seed and other purposes. In the present Chapter we deal with sugarcane as raw material for the production of sugar, reserving the question of gur for later discussion except in so far as it may be necessary to consider the bearing of one on the other.

39. Apart from seasonal conditions of rainfall at the time of planting the three main factors which determine the area of sugarcane from year to year are the price of cane, the price of gur, the price of sugarcane paid by factories in areas where factories exist and the prices of alternative cash crops. In most parts of India gur making is still of far more importance than sugar manufacture. Consequently the fluctuations in the acreage of sugarcane are mainly dependent on the price of gur relatively to the price of alternative cash crops such as jute in Bengal, wheat in the Punjab and cotton or groundnut in Bombay and Madras. In the United Provinces and Bihar the position is not quite the same. In the first place, speaking generally, alternative cash crops play a less important part in the domestic economy of the cultivator than in other parts of India; secondly, though in most parts of the two provinces the price of gur is still of great importance, the price paid for cane by factories has become a matter of consequence in areas where gur making has tended to decline or die out owing to the competition of factories for the available supply of cane.

Up to the year 1936 there is no reason to suppose that the production of sugarcane was in excess of the requirements of gur and sugar manufacture taken together. But in the 1936-37 season when the area had increased to 4,200,000 acres there was general decline in the price of gur and in some parts of the United Provinces and Bihar the supply of cane was so much in excess of the demand that in spite of the prolongation of the working season by factories some quantity of cane had to be destroyed. In consequence the area planted for the 1937-38 season declined in the principal sugarcane growing areas, except the Punjab and the North-West Frontier Province. In general the fall in the price of gur was

the main reason for the substitution of other crops, but in parts of the United Provinces and Bihar doubts as to the future price of cane and the ability of factories to absorb the supply had their influence on the cultivator. Whether the supply of cane in 1937-38 will prove adequate for the needs of factories in all areas remains to be seen, but clearly a danger has now arisen of over-production in one season followed by under-production in the next which may have serious consequences for both the grower and manufacturer.

40. Since the cost of cane represents on an average about 53 per cent. of the total cost of sugar manufacture, the price of cane is a matter of vital importance to the industry. The previous Tariff Board estimated the cost of cultivation of cane in Northern India at between 4 and 5 annas a maund and on this basis, allowing for interest on working capital, insurance against damage to crop, cost of transport and profit at one anna a maund, fixed the fair selling price of cane delivered at factory as 8 annas a maund which they expected to be 6 annas a maund at the end of 15 years, allowing for the spread of new varieties of cane and improved methods of cultivation which would reduce the cost of production. Actually the price paid by factories in the United Provinces and Bihar since 1935-36 has not generally reached this level and during the 1936-37 season fell to 3 annas per maund.

At the time of the Tariff Board report little had been done towards a scientific investigation of the cost of cultivation. In 1934 the Imperial Council of Agricultural Research decided to institute an enquiry into the cost of cultivation of cotton and sugarcane, the results of which are expected to be published shortly. It is unfortunate that the publication of the data must follow the completion of our report, but we have been given the opportunity of seeing some of the figures and have made use of them for comparison with the figures at which we had arrived independently. In the course of our enquiry we have taken particular care to obtain figures of costs and to examine representative growers in as many different localities as possible. During our tours we have visited agricultural stations and taken such opportunities as offered of inspecting the methods of cultivation practised by ordinary cultivators and discussing with them their estimates of cost and the difficulties they experience in the growing, transport and marketing of cane. The investigations we have been able to make in the limited time available have necessarily been less detailed than those conducted by the staff employed by the Imperial Council of Agricultural Research, but they have covered a wider field. The data we have collected comprise firstly, information supplied by small cultivators who cultivate their land with their own labour and the labour of their families, few of whom keep any record of their costs; secondly, figures given by large scale cultivators who employ hired labour most of whom maintain detailed accounts; thirdly, cost figures furnished by factories from their own farms and

fourthly, for purposes of check, figures of costs supplied by Government agricultural stations.

41. It is generally recognised that the calculation of cultivation costs incurred by the ordinary cultivator is beset with difficulties.

There is a South Indian proverb that if the costs of cultivation are reckoned up, nothing remains, not even the plough-share. Few ordinary cultivators make any attempt to keep accounts, and even if they do, there is the difficulty of assessing the money value of their own labour and that of their families and the labour of the animals they employ. In the case of sugarcane the problem is complicated by wide divergencies in methods of cultivation and in the duration of time the crop occupies the land. The length of time from the first ploughing of ground to the harvesting of the crop is an important consideration, since the longer the cultivation overlaps more than one season the less the opportunity of growing other crops. Another complication is that a plant crop of sugarcane, *i.e.*, a crop grown from newly planted 'setts' is frequently followed by a 'ratoon' crop, *i.e.*, a crop grown from the base of the previous year's cane. The cost of a 'ratoon' crop is considerably less than the cost of a 'plant' crop since no seed and less soil preparation are required, but the yield, at least in the case of the first 'ratoon', may be as high as that of the 'plant' crop though generally it is less. There is a divergence of opinion on the practice of ratooning. The net profit may be higher, but the danger of spreading cane disease is considerable in some areas especially if ratooning is continued for more than one season. Estimates of costs of cultivation and yields per acre have sometimes been made by taking 'plant' and first 'ratoon' crop together and striking an average, but as the practice of ratooning is by no means universal and its advisability is doubtful, we have taken the cost of cultivation of a 'plant' crop as the more convenient standard.

42. Estimates of cultivation expenses are most commonly classified under the heads of preparatory cultivation, seed and planting, manuring, after cultivation, irrigation (if any), harvesting and rent. To these we consider should be added an allowance for repairs and renewals of implements, interest on working capital, and insurance against abnormal losses of crop due to excess or deficiency of rainfall, cyclones, frost, and damage from insect pests or disease. These items are rarely taken into account by cultivators but are, in our opinion, legitimate charges.

Repairs and renewals are a comparatively small item for which an allowance of Rs. 3 per acre is adequate. Interest on working capital depends on the extent of borrowing necessary and the credit-worthiness of the borrower. The actual cash outlay of a cultivator need not be large if he employs mainly his own labour and the labour of his family, uses 'setts' taken from the previous crop as seed, and manures with his own farmyard manure.

Some cultivators do not borrow at all but most must borrow for their expenses till the harvest of the crop. The rate of interest may vary from 5 to 12 per cent. if the borrower can obtain a loan from a factory or a Co-operative Society, or from 12 to 36 per cent. if he has to go to the ordinary moneylender. We assume that half the estimated cost of cultivation is borrowed for a period of six months and that the average rate of interest is 12 per cent. As regards insurance against abnormal crop damage, the causes and degrees of loss are different in different localities. The danger of loss by drought depends on whether or not the land is commanded by an irrigation project. Floods are not infrequent in parts of the United Provinces and Bihar and cyclones recur at intervals mainly in the east coast districts but on the whole sugarcane is better able to withstand drought or excess of rainfall than other crops. The danger of damage from disease has decreased with the introduction of better varieties of cane, but damage from insect pests is sometimes severe in the sub-tropical region. During the last seven years the estimated percentage of yield of the sugarcane crop has not shown any marked variation, from which it may be concluded that abnormal losses of crop over wide areas are not of frequent occurrence. Five per cent. on the cost of cultivation is, in our opinion, a sufficient allowance to make.

43. Having stated the method of costing we propose to adopt, we proceed to an examination of costs of cultivation in the principal sugar producing areas.

From figures collected during the course of the recent enquiry conducted by the Imperial Council of Agricultural Research into the cost of cultivation by the ordinary cultivator we gather that the average cost of cultivation is approximately 4 annas 5 pies per maund including the cost of transport to factory. The cultivators examined by us were of a somewhat superior class with a higher standard of cultivation. Both costs of cultivation and yields per acre are higher than the figures of the Imperial Council of Agricultural Research, but the average cost per maund at which we have arrived, 3 annas 7 pies per maund, is almost the same, if the cost of transport is deducted from the Imperial Council of Agricultural Research's figure. The average cost of production of cane per maund as given by five factories for their own farms is 3 annas 1 pie without allowance for interest on working capital or insurance against abnormal losses of crop which we have included in our cost figures. The average cost of cultivation in Government agricultural farms is, we are informed, 3 annas 7 pies. The correspondence between the four sets of figures is fairly close after the necessary adjustments have been made. We think 3 annas 7 pies per maund is a fair estimate.

44. The average cost of cultivation for the small cultivator as estimated by the Imperial Council of Agricultural Research is, we understand, about 4 annas 2 pies including cost of transport to factory. The average

Bihar.

cost of production per maund as arrived at from the figures supplied by the witnesses we examined is 3 annas 3 pies. The average cost of cane per maund as given by 8 factories for their own farms is 3 annas 5 pies. On the other hand, the average cost per maund for farms managed by the Agricultural Department on commercial lines is as low as 2 annas 9 pies. The correspondence between the four sets of figures is not quite so close as in the case of the United Provinces but making necessary adjustments, the differences are small. 3 annas 4 pies may be taken as a fair average.

45. Though the Punjab is the second largest cane growing province in India it is mainly a gur producing area and comparatively unimportant from the point of view of sugar production. The enquiry conducted by the Imperial Council of Agricultural Research was, we understand, directed to the cost of cultivation of cane for the production of gur and not to the production of cane for delivering to factories as in the case of the United Provinces and Bihar. The data available is less complete than in the case of other provinces, but from such figures as we have been able to obtain we estimate the cost of production of cane at 5 annas per maund for the area in which factories are situated.

46. As in the case of the Punjab, the figures obtained in the course of the Imperial Council of Agricultural Research enquiry relate to the production of cane for the manufacture of gur. From the information we have been able to obtain, we estimate the cost of production at 4 annas per maund.

In order to arrive at a fair average price for the sub-tropical region it is necessary to take into consideration the fact that 105 factories are situated in the United Provinces and Bihar as against 16 factories in the Punjab, Bengal and other areas. An arithmetical average of all areas taken together would not be suitable, giving due weightage to the United Provinces and Bihar figures, we consider that 3 annas 7 pies per maund may be taken as a fair estimate.

47. With one exception all the Bombay factories are concentrated in the Deccan canal tract. The standard of cultivation in the area is exceptionally high and both the cost and yield per acre are above the figures of almost every other part of India. The high cost is due partly to the practice of heavy manuring, but mainly to the high rates charged for irrigation from canals to which allusion has already been made. The average cost of irrigation for a season, as supplied by factories, ranges from Rs. 49 to Rs. 90. We understand that the Government of Bombay have decided to review the irrigation rates which are abnormal in comparison with rates in other parts of India. A peculiarity of factories in Bombay is that they meet all or the major part of their cane requirements from their own farms and have their own tramway systems for its

transport. From figures supplied by six factories we find that the average cost of cultivation is 5 annas 8 pies per maund. From figures given by cultivators it would appear that the average cost of cultivation is 6 annas 4 pies which is high in comparison with the figures arrived at during the Imperial Council of Agricultural Research's enquiry. We consider that 5 annas 10 pies may be taken as the average cost of production per maund allowing for the fact that most of the cane crushed is grown on factory farms.

48. Unlike Bombay, factories in Madras are scattered in different parts of the province, the conditions of which are dissimilar. It is therefore more difficult to arrive at a correct estimate of the average

cost of cultivation. Speaking generally, the cost of cultivation is lower in the northern area where the majority of factories are situated than in the central and southern areas. Another complication is that in coastal districts where cyclones are of frequent occurrence it is necessary to prop the cane with bamboos to prevent lodging. 5,000 bamboos per acre are required and allowing for the fact that two-thirds of the bamboos can be used again in the following season, the additional cost may be estimated at Rs. 80 per acre. In the northern area a landowner who is interested in a small co-operative cane factory has supplied us with cost figures for 8 different plots of land, growing different varieties of cane. His average cost we estimate to be 3 annas 6 pies per acre, but the cost of cultivation by an ordinary cultivator is above this figure. In other areas the cost figures are higher and range from 4 annas 6 pies to over 6 annas. For the whole Province we think that the cost of cultivation may be taken as 5 annas per maund. The average cost of cultivation for Bombay and Madras taken together is 5 annas 5 pies per maund which may be taken to be the average cost of cultivation in the tropical region.

We have made no detailed examination of the costs of cultivation in other provinces where sugar production is at present unimportant or in Indian States. The figures of costs and yields per acre given in the descriptive paragraphs of Chapter II are those supplied by the Governments concerned.

49. It will be observed that the present differences in the cost of cultivation as between different provinces is considerable, but it does not follow that these differences necessarily always continue. Research work was taken up at the Coimbatore Station on 'thin' varieties of sugarcane suitable to the conditions in North India as early as 1912 but it was not until 1926 that systematic investigation began on 'thick' or 'noble' varieties of cane suitable for the tropical region. During the last seven years improved varieties of cane from Coimbatore have been introduced into the major part of the sub-tropical region, but the first improved 'thick' variety was not evolved until 1930 and the new types have not yet been completely tested or released for general cultivation in the tropical region. Where the latest new varieties have been tried, yields

of 40 to 60 tons have been obtained and under special conditions a maximum of over 100 tons. Allowing for some climatic advantage, the possibilities of a general improvement in tonnage and quality are greater in the south than in the north and an equalisation of the cost of production is, according to expert opinion, feasible at no distant date. In any case, for the purpose of estimating an All-India figure, greater weight must be given to the cost of cultivation in the United Provinces and Bihar, the main sugar producing areas. Taking all points into account, we consider that $3\frac{3}{4}$ annas may be taken as a reasonable estimate of the cost of cultivation for the whole of India.

There remains the question of profit to the cultivator over and above the estimated cost of production. The previous Tariff Board took 1 anna a maund on the assumption that nothing less would be a sufficient inducement to the cultivator to expand sugarcane cultivation. The question of expansion of cultivation no longer arises because the total area under sugarcane is now equal to, if not in excess of, all requirements. We have therefore to consider what may be considered a reasonable margin of profit to give the cultivator a fair share in the benefits of protection. Six pies per maund on an estimated cost of $3\frac{3}{4}$ annas is in our opinion a fair figure. Adding the two, 4 annas 3 pies per maund is our estimate of the fair price.

50. The previous Tariff Board found the cost of cultivation by an ordinary cultivator in the six principal sugar producing provinces was as follows:—

Comparison of cost of cultivation.

United Provinces	. . . . .	4 to 5 annas a maund.
Bihar	. . . . .	4 to 5 annas a maund.
Punjab	. . . . .	5½ annas a maund.
Bengal	. . . . .	7 annas a maund.
Bombay	. . . . .	12 annas a maund.
Madras	. . . . .	7 to 12 annas a maund.

They came to the conclusion that in Northern India (the sub-tropical region) the average cost of cultivation was between 4 and 5 annas a maund. In estimating the fair selling price they added 3 pies for interest and $1\frac{1}{2}$ annas for cost of transport, and taking all factors into consideration adopted a figure of 7 annas a maund. To this they added 1 anna a maund as profit to arrive at a fair selling price of cane of 8 annas a maund delivered at factory. They recognised the difficulty of estimating the fair selling price at the end of the period of protection but on the evidence tendered by the Imperial Council of Agricultural Research expected improvements in methods of cultivation and in the variety of cane to reduce the cost of cultivation by two annas a maund. Their expectation has already been more than fulfilled. A comparison between the figures given by them of the cost of cultivation and the figures we have obtained in the course of our enquiry, typical

examples of which are printed in Appendix A of our report, will show the extent to which improved varieties of cane and better methods of cultivation have increased the yield per acre and reduced the cost of production. In Bombay, for example, the cost of cultivation per acre has fallen from Rs. 586 to Rs. 400 while the yield has risen from 901 to over 1,100 maunds. Again, the Bihar Planters' Association which in 1930 gave the cost of cultivation as Rs. 110 per acre for a yield of 375 maunds puts the cost of cultivation in 1937 as Rs. 64 for a yield of 400 maunds. Lastly, in the United Provinces the cost of cultivation in the Government Agricultural Station at Shahjahanpur which in 1930 was estimated at Rs. 236 for a yield of 881 maunds is reported to have fallen to Rs. 175 for a yield of 950 maunds. It may be added that the average All-India yield per acre which in 1930-31 was estimated to be 12·3 tons has risen in 1936-37 to 15·6 tons per acre.

51. We pass next to the question of the cost of transport. Unlike most other crops sugarcane cannot be stored. When once it is cut, it must be transported as rapidly as possible to the place of manufacture if it is not to lose in weight and quality. Cane is transported to factories by road, by rail, by tramway and to a very small extent by water. We propose to consider the first three methods of transport separately and compare their respective advantages and disadvantages.

52. The country cart still plays the most important part in the transport of cane. Within a radius of 16 miles cane is usually transported by cart direct to factories and sometimes over longer distances. Cane so delivered to factories is commonly known as 'gate' cane. The proportion of 'gate' cane, which has tended to increase recently, is estimated on an average to be 65 per cent. of the total supply to factories but varies considerably in different areas. The main advantages of 'gate' cane are firstly, that it requires less handling since it comes direct from field to factory, secondly (and most important) that it arrives in fresh condition, and thirdly, that with proper organisation a uniform supply from day to day can be regulated. One disadvantage is that any hitch in the organisation may result in a congestion of carts and delay in unloading. The main difficulty of transport by cart is the inadequacy of roads and their bad condition, especially in the United Provinces, Bihar and Bengal. Inadequacy of roads restricts the radius of direct supply to factories and the bad condition of roads increases the cost of transport, taking into consideration loss of time and the wear and tear on vehicles and animals. Numerous representations have been made to us on this subject both by factories and cane growers. From personal observation we find their complaints to be fully justified.

Extension and improvement of road communication is, in our opinion, an urgent necessity. Something might also be done to increase the carrying capacity of carts, for example, by the use of

rubber tyres. The average tonnage carried by the country cart may be estimated at 19 maunds. Rubber tyred carts, we are informed, are capable of carrying at least double this quantity.

Motor lorries are employed only to a limited extent for the transport of cane, mainly for bringing cane from collecting depôts. The development of this form of transport is dependent on an improvement in communications.

53. Second in importance is the transport of cane by rail. Cane is brought by cart to weighbridges located in the neighbourhood of

Transport by rail. railway stations and thence railed to factories, most of which have special sidings in their premises. Cane is transported from distances as long as 125 miles but the average distance may be taken as 40 miles. Complaints of delay in delivery of cane have been made to us in some areas, but on the whole railway arrangements appear to be not unsatisfactory. But however prompt delivery by rail may be, cane can rarely reach factories in as fresh condition as 'gate' cane. The most important consideration is, however, the question of cost. Apart from actual freight charges, factories are put to the expense of paying commission for the purchase and despatch of cane.

54. Transport by tramway is on a different footing to rail transport; excepting one public tramway which serves part of the factory area in the Meerut district of the United Provinces, tramways are owned and operated by factories mainly to convey cane grown in their own farms. 17 factories have private tramway systems and 2 factories propose to adopt this method of transport. The advantage to factories who grow their own cane is that the average cost of transport by tramway is lower than the cost of transport by cart. Tramways enable cane areas to be tapped in which other forms of transport are difficult or impossible. We are informed that more factories would adopt this method of transport but for the difficulty of obtaining possession of land in localities where the fragmentation of holdings necessitates purchase from a large number of small owners.

55. Transport of cane by water is confined to a few factories located in proximity to navigable waterways. The total quantity of cane so transported is so small that it may be left out of account.

56. The cost of transport by cart depends chiefly on the length of lead from the field to the factory which may be as short as a few furlongs and may be as long as 16 miles or more. Most growers use their own carts, but many have to hire. Other factors affecting the cost are the condition of roads and the length of time carts are detained before unloading. There is considerable variation in the estimated cost in different localities. It ranges generally from 1 pie to 2 pies per maund per mile, but in exceptional cases is higher. The general consensus of opinion is that $1\frac{1}{2}$ pies per maund per mile

for a lead of 8 miles, *i.e.*, one anna per maund of cane delivered at weighbridge, may be taken as a fair average, equivalent to Rs. 1-3-0 per load, assuming an average load of 19 maunds.

In the case of 'rail' cane, the cost of transport is necessarily higher and factories import cane by rail only when they are unable to obtain a sufficient supply of 'gate' cane from their immediate neighbourhood. Apart from freight and loading charges, commission has to be paid for the purchase and despatch of cane. Freight rates for cane vary considerably on different railway systems.

The Indian Sugar Mills' Association estimate the average lead as 40 to 45 miles and the average cost as 1 anna to 1 anna 6 pies. From figures supplied by factories we find that 35 to 40 miles is the average lead in present condition.

The previous Tariff Board drew attention to the fact that under a zoning system it would be possible to reduce haulage charges and published some interesting calculations made by Mr. Noel Deer, Messrs. Begg Sutherland Company's Chief Chemist. We agree that with a proper organisation of zones of operation for the supply of cane, there is room for a reduction in the average lead and in haulage charges. We think that 9 pies per maund may be allowed on this account including loading charges. The average rate of commission paid for the purchase of cane is 3 pies per maund. Taking freight, loading charges and commission together, we consider that 1 anna per maund may be taken as the cost of transport by rail.

The average cost of transport by tramways is 3 to 7½ pies per maund. The quantity of cane so transported is small compared with the quantity transported by cart or rail.

We have now to calculate the average cost of transport of cane per maund for 'gate' cane and 'rail' cane taken together leaving out of account the comparatively small amount of cane transported by tramway or water. The cost of 'gate' cane delivered at the factory is according to our calculation 5 annas 3 pies. We are aware that commission is sometimes paid for the purchase of 'gate' cane, but ordinarily this expenditure should be unnecessary because factories can and, in our opinion, should deal direct with growers without the intervention of middlemen. We have allowed for the cost of organisation of cane supply and the unloading of cane at factory in manufacturing charges under the head of Labour.

The cost of 'rail' cane delivered at factory is 4 annas 3 pies *plus* 1 anna 9 pies for cartage, freight and commission or 6 annas in all. Cartage is taken as 9 pies per maund as the lead from field to railway stations is generally less than the lead for 'gate' cane delivered at factory for which 1 anna has been allowed.

For the purpose of calculating an average cost of cane delivered at factory by whatever means it is transported, allowance has to be made for the fact that the proportion of 'gate' cane is higher

than the proportion of 'rail' cane. From figures furnished by factories we find that the proportion is 65 to 35. Making this adjustment the average cost of cane delivered at factory is 5 annas 6 pies per maund.

We desire to make it plain that this All-India average price of cane which we consider a reasonable figure for inclusion in the cost of manufacture in estimating the fair selling price of sugar for the remaining period of protection is not to be regarded as a suitable minimum price in any particular area or any particular province. Since sugar recovery from cane is about 10·5 per cent. in the tropical region against 9·5 per cent. calculated by us as the All-India average, factories in Bombay and Madras can afford to pay 6 pies more per maund of cane to the grower. The cost of transport in Bombay is also lower because factories have their own tramway systems. On the other hand the price of 5 annas 3 pies is above the average price of cane in the main sugar producing belt of the sub-tropical region during the last season.

57. In 1934 the Sugarcane Act came into force which empowered Local Governments to declare any area a controlled area and to

<p>Fixation of minimum price.</p>	<p>fix the minimum price of cane in controlled areas. Two Local Governments, the United Provinces and Bihar, proceeded in 1934 to fix minimum prices. Other Local Governments have, so far, found that the demand of factories for the available supply of cane was such that price fixation was unnecessary. The minimum prices fixed by the Governments of the United Provinces and Bihar were based on the price of sugar realised by mills in each fortnight of the working season according to a sliding scale. No particular difficulty arose in the first two years because the supply of cane was not generally equal to the demand of factories, especially towards the end of working seasons, with the result that many factories paid prices above the minimum. In 1936-37, however, owing to an expansion of acreage and favourable seasonal conditions, the supply of cane in most, though not in all, factory areas was larger than ever before. By mutual arrangement most factories began crushing cane later than usual since stocks of sugar in hand were above normal. Consequently at the end of March, 1937, the quantity of cane remaining to be crushed was abnormally large and in excess of the probable demand. At this juncture manufacturers contemplated closing down their factories in view of the continued fall in the price of sugar and difficulties in disposing of their stocks the reasons for which are explained in a later Chapter, but as a result of a special appeal by the two Local Governments, backed by the pressure of public opinion, most factories agreed to continue crushing in consideration of a reduction in the price of cane which then stood at 4 annas in the United Provinces and 3 annas 9 pies in Bihar. In consultation with representatives of manufacturers and growers, successive reductions in prices were made in April and May until it fell as low as 3 annas a maund in some areas at the end of the season.</p>
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The virtual breakdown of the arrangement for the fixation of minimum prices on the basis of the price of sugar led to a series of conferences in 1937 between the Governments of the United Provinces and Bihar and representatives of all branches of the industry, which resulted in the fixation of an irreducible minimum price of 5 annas a maund for cane delivered at railway stations and 5 annas 3 pies for cane delivered at factories for the 1937-38 season.

Fixation of a minimum price implies interference with the operation of the ordinary laws of supply and demand, the effect of which on the production of sugar may be far-reaching. It has been pointed out that a price based on theoretical costing estimates is likely to be higher than the price which is a sufficient inducement to the cultivator to continue sugarcane cultivation, since in practice he takes no account of depreciation, interest on working capital and insurance against abnormal losses of crop and regards a cash return equivalent to the value of his labour and the labour of his family as his profit. In the United Provinces, Bihar and the Punjab, we are informed, sugarcane cultivation is looked upon as a way of life which gives the cultivator and his family occupation during the slack period of the agricultural year and which he is reluctant to abandon however slender the margin of profit, because he can find no suitable alternative. In present conditions the Indian Sugar Mills Association suggest that in the United Provinces and Bihar a price of 4 annas a maund for cane delivered at factory would be a sufficient inducement to the cultivator to continue cultivation and that any higher price would tempt him to expand cultivation to an extent which would amount to overproduction. It is no doubt a fact that in some areas cultivators may be prepared to deliver cane at 4 annas a maund to factories and that a price above this may lead to an expansion of cultivation, but a price of 4 annas a maund does not, we have found, cover the entire cost of cultivation apart from profit. If a price higher than 4 annas is likely to lead to overproduction, production must be regulated.

58. It has been recognised that legislation empowering Local Governments to fix minimum prices for cane is not by itself sufficient to safeguard the interests of the cane

Safeguards for the cane grower.

grower and protect him from exploitation. Under the Sugar Industry (Protection) Act, 1932, power was conferred on Local Governments to make rules requiring 'Notices of prices of sugarcane to be posted up in sugar factories' and under the Sugarcane Act of 1934 power to make rules to provide for 'the issue of licences to purchasing agents, the fees for such licences and the regulation of the purchase and sale of sugarcane by and to such agents' and to provide 'for the organisation of growers of sugarcane into Societies for the sale of sugarcane to factories'.

For the purpose of carrying into effect the objects of the Sugarcane Act and enforcing the rules made under it, the Governments of the United Provinces and Bihar appoint every year for the

duration of the manufacturing season a number of Cane Inspectors whose duty it is to protect the interests of the cane grower in general and in particular to see that sugarcane is properly weighed and paid for by factories according to the scale of minimum prices laid down. We have examined Cane Inspectors and other officials responsible for the working of the rules and taken evidence from canegrowers and other non-official witnesses who possess personal knowledge of the matter. Complaints of the conduct of factories and their agents are, we find, widespread and the general truth of the complaints is admitted by all the official witnesses we examined. It is alleged that there are some factories who underweigh cane or underpay for cane. Other factories shut their eyes to the doings of their agents or at least take insufficient measures to control them. Not many factories realise their responsibilities toward the cane grower and have so organised their cane supply as to reduce to a minimum the opportunities for malpractices by their agents and subordinates. We realise that in complaints of this kind there is generally an element of exaggeration. We also realise that with the best intentions it is impossible for a factory to keep a constant watch over all its agents and subordinates in the busy season, when cane crushing is going on night and day, but making all allowances we feel bound to state that the prevalence of malpractices, a matter of common knowledge, is a serious problem. The detection of offences, we are informed, is by no means an easy matter. The number of inspecting officers is limited and we are informed their movements are closely watched. The appointment of additional Cane Inspectors might help to check abuses but the real remedy, in our opinion, lies in the better organisation of cane supply.

Sugarcane is purchased by factories either direct from growers or through agents who are paid commission. In the case of direct purchase some old established factories in course of time have evolved an elaborate system under which each grower is issued a kind of pass book in which are entered debits for advances received and credits for cane delivered. The cane grower can draw from time to time what money he requires against deliveries of cane and the account is finally settled and closed at the end of the season. For the delivery of cane, passes commonly known in the north as 'Purjis' are issued, sometimes of different colours for different days of the week, in which entries are made of the quantity of cane to be delivered and the date of delivery. By means of these passes the daily quantities of cane required by the factory can be systematically regulated, thus ensuring a uniform supply and obviating the danger of a congestion of carts and undue detention before unloading, a matter of great importance to the grower. This system implies a preliminary survey of the crop on the ground in the villages which serve the factory and the apportionment of quotas of supply in each area spread over the whole season. It involves extra work and expense in organisation but is considered necessary by good factories in order to maintain close relations with the grower and so ensure a uniform supply of cane in fresh

condition. The degree of elaborateness in organisation varies from factory to factory. Some new factories have not yet had the time to perfect their arrangements, but there is an increasing realisation of the fact that organisation of cane supply is essential in the interest of both factories themselves and cane growers. Unquestionably direct purchase of cane from growers is in every respect preferable to purchase through agents but is not always possible, mainly because few factories in the United Provinces and Bihar can rely on a sufficient supply of 'gate' cane drawn from an area which they can control. In present conditions the employment of purchasing agents may be necessary, but they are responsible for most of the malpractices by which the grower suffers. Purchasing agents under the terms of the Sugarcane Act have to be licensed, but some of the persons employed by factories are, we are informed, far from desirable. Purchasing agents are paid commission on the quantity of cane supplied, but there is evidence that many of them supplement their earnings by malpractices of various kinds. Official witnesses have enumerated 20 different ways in which the cane grower can be cheated, mainly by means of the underweighting of cane, the underpayment for cane and the sale of passes for the delivery of cane. Factories, we believe, are coming to realise the undesirability in their own interest of employing an intermediary agency for the purchase of cane. We feel no doubt that the sooner the purchasing agent can be abolished the better.

The malpractices to which we have referred occur mainly in the United Provinces and Bihar: elsewhere in India we have received little in the way of definite complaint. The reason, no doubt, lies in the fact that outside the United Provinces and Bihar the supply of cane is barely sufficient for the requirements of factories and the cane grower is not so dependent on the factory for the utilisation of his cane. If the factory does not treat the grower fairly, the grower will convert his cane into gur or fall back on some alternative cash crop.

59. Apart from malpractices the cane grower is often put to inconvenience and loss through the faulty organisation of cane supply resulting in the congestion and unnecessary detention of carts to which allusion has more than once been made. Arrangements for the supply of water and provision of shelter for cartmen and their animals are often inadequate. By restricting the numbers of carts to the requirements of each day through a system of delivery passes and by the proper marshalling of carts on their arrival at the factory, the period of detention need not be longer than 4 to 8 hours at most. But at factories where there is no organisation or the organisation is defective, the period of detention may be anything from half a day to one, two or even three days. Apart from the loss of time, the undue detention of carts gives an opening for bribery and corruption. We are told that at some factories if there is a serious congestion of carts, growers are prepared to part with their cane at any price or to offer bribes to subordinates to

get their turn at the weighbridges. So serious is the matter of detention that we consider that a system of delivery passes for carts should be made compulsory in all factories.

60. We have dealt at some length with the disadvantages under which the cultivator in the United Provinces and Bihar

labours as the matter has been given prominence in the evidence we have received. As another measure of protection

to the grower our attention has been drawn to the importance of cane growers societies for the sale of cane, mention of which is made in the Sugarcane Act of 1934. In the United Provinces and Bihar special establishments have been employed in the organisation of co-operative societies for the development and improvement of cane growing and for the supply of cane in factory areas. Cane supply societies have made some progress in the United Provinces though difficulties have arisen from lack of experience in management. Factories who have co-operated in the formation of societies are, we understand, not altogether satisfied with their methods of working. One society we visited in the Dehra Dun District has, however, met with a considerable amount of success. The Indian Sugar Mills Association lay stress on the point that co-operative cane supply societies should consist only of genuine cane growers and that their management should not pass into the hands of persons whose sole interest lies in the amount of commission paid by factories. No doubt the management of these societies is a matter of considerable difficulty, but in time, as experience is gained, they should serve a useful purpose in the organisation of cane supply especially in areas situated at a distance from factories when direct dealings with individual growers are difficult.

61. In view of the experience of the last two years the regulation of cane supply in the United Provinces and Bihar has become,

in our opinion, a matter of the first importance both from the point of view of the cane grower and of the manufacturer. The only practicable solution appears to be the organisation of zones of operation in factory areas.

The main feature of the system is the allotment of a definite area of supply to each factory from which it can draw at least the major portion of its cane supply and on which no other factory can encroach. The question of zoning was considered by the last Tariff Board which arrived at the conclusion that it was not a practicable proposition unless minimum prices of cane were fixed by legislative enactment. Since 1933 a number of inconclusive conferences on the subject have been held, and it is only recently that the force of circumstances has compelled a general measure of agreement on the necessity of 'zoning'.

The chief danger of a zoning system is that it eliminates the element of competition for cane between factories and so places the grower in a zone to some extent at the mercy of the factory to which the zone is allotted. We agree with the previous Tariff

Board that the fixation of minimum prices of cane is an essential preliminary to the legal recognition of zones. For this reason zoning is at present impracticable in provinces other than the United Provinces and Bihar, who alone have so far fixed minimum prices. In other parts of India factories are located at such a distance from one another that no question of allotment of a special zone of operation arises except perhaps in the areas of the Punjab and Bengal which border on the United Provinces and Bihar.

The advantages claimed for a zoning system are, firstly, that it facilitates the regulation of cane production and so lessens the danger of a vicious circle of overproduction in one season followed by underproduction in the next. If estimates of factory requirements are made in advance and contracts entered into with growers on the basis of those estimates, growers will know how they stand and will not be tempted to grow cane in excess of factory requirements as happened in some parts of the United Provinces and Bihar in 1937. Secondly, the allotment of a zone to a factory will enable the factory to develop and improve cane growing within its zone without the danger of another factory stepping in to reap the benefits. We are informed that the encroachments of factories on one another's natural areas of supply has forced factories to restrict the help they might otherwise give to growers in the form of cash advances and the supply of seed and manure during the cultivation season. Some factories, we are told, have been obliged to discontinue the system of advances, because growers after receiving advances sold their cane to a rival factory. Thirdly, factories will be enabled to arrange the harvesting of cane at the time it reaches maturity so as to reduce the loss in the sucrose content resulting from the use of under ripe or over ripe cane, and to regulate the delivery of cane at factory in such a way as to minimise the time between cutting and crushing, thus obviating the loss of weight and deterioration in quality due to dryage and at the same time preventing the unnecessary detention of carts. Fourthly, the encouragement to direct dealings with growers will, to a great extent, eliminate the middleman and lessen the possibilities of the malpractices to which we have referred. Another advantage of the zone system is that besides enabling factories to raise the general standard of cultivation among growers, it will facilitate the introduction of early and late varieties of cane with a view to the prolongation of the working season. One disadvantage of a fixed minimum price for cane is that the same price is paid for cane, good, bad and indifferent and, therefore, the cultivator has little direct encouragement to grow special varieties of cane to suit the requirements of factories. A system of premium payments for special varieties of cane should, in our opinion, be feasible within the limits of zones. Lastly, within their zones factories may be induced to take an interest in the development and improvement of roads and the opening of tramway systems. We have already drawn attention to the generally unsatisfactory condition of communications. So

important is the matter from the point of view of both the grower and the manufacturer that a special development scheme of communications in factory areas to which factories should be under an obligation to contribute is, in our opinion, deserving of consideration.

62. In the course of our enquiry we have paid special attention to the question of zones of operation, but we do not consider it necessary to discuss the details at any greater length because the matter is under the active consideration of the Governments of the United Provinces and Bihar. We realise the many practical difficulties that arise in the apportionment of zones, but provided that adequate arrangements are made to safeguard the interests of the grower, we think that a zoning system is desirable and indeed necessary in present conditions. In Southern India where factories have not to fear competition we have seen the extent to which good organisation is capable of giving practical assistance to the grower. One established factory we visited has made a practice for many years of entering into contracts with growers at the time of planting for the supply of cane at a fixed minimum price with a bonus above the minimum if the price of sugar rises above a certain level. This factory gives advances to the extent of Rs. 4 to 5 lakhs a year and has incurred practically no bad debts nor has it experienced difficulty in making premium payments for special varieties of cane. Another factory gives advances in the form of seed and manure at concessional rates and has developed a road system in its area of supply. In Bombay most factories have found it worth while to develop tramway systems for the transport of canes. Speaking generally, we have found that the relations between factories and growers are closest and most harmonious in areas where factories are free to develop their natural areas of cane supply without the danger of encroachment by other factories.

63. Our general conclusion is that, granted the necessity of interference with the operation of the ordinary law of supply and demand in the interest of the cane grower, the regulation of cane production is essential. Otherwise a minimum price of

Regulation of cane
production. cane fixed at a level which will ensure the grower his fair share in the advantages of protection may prove so attractive as to induce an expansion of cultivation amounting to overproduction. We are unable to suggest any better method of regulating supply than a zoning system under which factories will enter into definite agreements with cultivators at the time of planting for the supply of cane according to their estimated requirements. But if a zoning system is introduced it will, in our opinion, be necessary to control the erection of new factories and the extension of existing factories by some licensing system. Otherwise the danger might arise of the disorganisation of an agreed arrangement of zones.

Attempts to organise zones of operation on a voluntary basis have met with only limited success. In some areas factories have

entered into private arrangements, known as boundary arrangements, not to encroach on one another's areas of supply, but every scheme for a general organisation of zones has broken down owing to the refusal of some factories to co-operate. Legislation will, in our opinion, be necessary for the regulation of zones and the licensing of factories and also for the creation of statutory bodies to carry out the purposes in view. Additional staff will no doubt be necessary especially in the initial stages to control the working of the system and to protect the interests of the grower. It has been pointed out to us that organisation of cane supply on the lines proposed will throw additional expenditure on factories. That is, no doubt true, but against the additional expenditure must be set savings in commission paid to middlemen. Ultimately the initial outlay on the organisation of cane supply should be repaid by the improvement in the quality of the cane supplied which, as we shall show later, is an important element in the cost of manufacture. There is thus no real conflict of interest between the manufacturer and the grower, but if any conflict occurred in this or any other matter, the interests of the ryot must prevail over every other in the consideration of questions affecting the future of the industry as the Indian Sugar Mills Association have stated in express terms.

CHAPTER IV.

Raw material (Gur).

64. Gur spelt 'gul' in Bombay and known as jaggery in South India may be defined as cane juice boiled to a temperature of 114° to 115° C. so as to set on cooling and partially clarified during the process of boiling. It contains 50 to 80 per cent. of sucrose, 8 to 20 per cent. inverted sugar and small quantities of mineral salts, ash and moisture. Since gur is produced by cultivators in or near the fields where sugarcane is grown by very primitive methods and these methods differ widely in efficiency from one area to another, its quality varies in different parts of India from the hard golden yellow variety of Meerut and Punjab to the black viscous form produced in East Bengal. Small quantities of gur are also produced from molasses obtained in sugar manufacture by the open pan process. The 'molassine' gur thus produced is of a different quality.

Gur is marketed in different shapes in different areas such as cubes in South India, cones and spheres in Bombay, hemispherical form in the United Provinces and semi-liquid form in portions of Bengal. Most of the gur manufactured passes into direct consumption, but on an average 2.5 per cent. is used as raw material for the manufacture of sugar in refineries. In this connection mention may be made of 'rab', the raw material used for the manufacture of sugar by indigenous processes commonly known as khandsari sugar. 'Rab' is a substance not unlike gur but differs from it in the degree of its consistency and physical structure owing to the lower temperature to which the cane juice from which it is made is boiled. 'Rab' is occasionally eaten in its raw state, but by far the greater quantity is used for the manufacture of sugar. The molasses obtained in the course of manufacture is generally converted into gur by reboiling, sometimes with an admixture of fresh juice.

65. The manufacture of gur consists of two main processes—the crushing of cane and the boiling of juice. Both operations are generally performed in villages by the growers of cane themselves but occasionally gur is manufactured on a contract system. The crushing is usually done by a bullock driven 3-roller iron mill. The mills, known as 'kolhoos' in North India, are usually hired by the cultivator or a group of cultivators. Power driven mills are not commonly used. Extraction of juice from cane is 55 to 60 per cent. in the case of bullock driven mills and 65 to 70 per cent. in the case of power driven mills. Though the extraction from a power driven mill is higher, the price is beyond the reach of an ordinary cultivator. Those in operation are generally for concerns manufacturing sugar by the open pan process.

The juice on extraction flows into underground earthen vats from which it is conveyed in earthen or tin pots for the second

operation which consists of boiling, clarifying and solidifying. The boiling is performed differently in different parts and it is on this operation more than on any other that the quality of gur produced depends. We have been told that the quality is affected not only by the temperature to which the juice is boiled but also by the method of application of heat and the size and shape of the boiling pans. Generally one or two pans are used for boiling but in some instances the number is as many as 13 arranged in a series. In Northern India and Bombay a series of pans is known as a 'bel'. The juice is clarified in two stages. When it is just warm, a sufficient quantity of *bhindi* (lady's finger) mucilage is added which collects the colloidal matter of the juice on the surface. The scum is then removed by a ladle and some alkali solution is added. After the juice has been boiled to a temperature of about 114° C., the syrup is poured into a shallow cooling pan where it is continuously stirred. The process of stirring effects a uniform cooling, helps crystallisation and gives the gur a good physical structure. When the syrup is about to set, it is transferred into earthen or tin pots of the size and shape in which it is proposed to market the finished product.

66. Research has been undertaken both at the Institute of Sugar Technology at Cawnpore and Agricultural Institute at New Pusa, and by the Agricultural Departments of provincial Governments on practically every operation in gur manufacture. At the Institute a new bullock mill working on ball bearings has been evolved which is expected to give a higher extraction as well as diminishing strain on bullocks. We understand that a scheme for the utilization of power driven mills for gur manufacturing concerns by electric power is under the consideration of the Government of the United Provinces for the tube well area of the western tract. The crushers will be worked by cultivators themselves through the agency of a crushing society. Two sets of boiling pans will be required for each crusher. The capital cost is estimated at Rs. 2,200 and the cost of manufacture Re. 0-5-6 per maund of gur made. The various systems of *bels* have been tested in the Institute and by the Agricultural Department of the United Provinces and a simple *bel* with 3 or 4 pans capable of boiling 25 to 40 maunds of juice per day has been recommended. An improved type of furnace with a flue has also been devised which increases the efficiency of fuel. In Bombay and Bengal the Agricultural Departments have conducted research on the shape and size of boiling pans. As a result of research at the Research Institute at New Pusa and by the Agricultural Department in Madras, the use of active charcoal prepared by incomplete combustion of paddy husk has been found to be feasible. As the crystallisation of sugar in gur depends to a large extent on the process of boiling, research work on improved methods is of great importance. The loss of sucrose in gur through inversion is much more disadvantageous in the case of refining gur than of eating gur. At present only about 56 to 59 per cent. of sugar is recovered from gur. With improvements in manufacture

of gur, the refineries which during the last two years have found it unprofitable to work, may be able to restart operation thus providing an outlet for surplus gur.

67. As regards the cost of manufacture, an enquiry was conducted in 1934-35 and 1935-36 in the Punjab and the United Provinces the results of which have been communicated to us by the Imperial Council of Agricultural Research. The following Table summarises the conclusions arrived at:—

TABLE VIII.

Province and District.	Cost of manu- facture of gur per maund including cost of human and bullock labour and interest and deprecia- tion charges on cane crushers and pans, etc.	Price per maund.	Gross income.	Return per maund of cane 10 maunds= 1 maund of gur.
PUNJAB.				
Lyallpur—	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1934-35 . . .	1 5 0	4 13 2	3 8 2	0 5 7
1935-36 . . .	1 5 8	4 6 5	3 0 9	0 4 10
Jullundur—				
1934-35 . . .	1 5 1	4 12 5	3 7 4	0 5 6
1935-36 . . .	1 0 1	4 5 5	3 5 4	0 5 4
Gurdaspur—				
1934-35 . . .	2 0 0	4 8 11	2 8 11	0 4 1
1935-36 . . .	1 14 3	4 0 5	2 2 2	0 3 5
UNITED PROVINCES.				
Meerut (ratoon crop)—				
1934-35 . . .	0 11 5	3 14 6	3 3 1	0 5 1
1935-36 . . .	0 10 8	3 3 9	2 9 1	0 4 1
Meerut (Plant cane)—				
1934-35 . . .	0 14 3	3 14 7	3 0 4	0 4 10
1935-36 . . .	0 10 5	2 15 5	2 5 0	0 3 8
Gorakhpur—				
1934-35 . . .	0 15 7	4 2 4	3 2 9	0 5 1
1935-36 . . .	1 7 0	3 3 8	1 12 8	0 2 10
Rohilkhand—				
1934-35 . . .	0 12 8	4 0 10	3 4 2	0 5 3
1935-36 . . .	0 5 9	3 2 6	2 12 9	0 4 6

In a more recent enquiry conducted by the Imperial Council of Agricultural Research in selected provinces figures have been obtained of the cost of production of gur in Madras, Bombay and Bengal. These figures, we understand, are somewhat lower than the figure of Rs. 3-15-0 which has been furnished to us in the course of our enquiry as the cost of production in Madras and Bombay. The cost of production in Bengal which is estimated at Rs. 3-1-0 is the same as in the United Provinces and the Punjab.

The previous Tariff Board estimated the cost of manufacture of gur including the value of the labour of the cultivator and his bullocks but excluding raw material at Rs. 2-0-0. The estimates we have received of the present cost of manufacture vary from annas 12 to Rs. 1-5-0 per maund. Rs. 1-1-0 may be taken as the fair average which approximates to the average cost in the United Provinces and the Punjab as given in Table VIII. Taking 4 annas as the present cost of cane, the cost of production of one maund of gur would be Rs. 3-9-0.

68. The best qualities of eating gur are produced in Coimbatore district in the south, Kolhapur in the Bombay province and the Meerut District in the United Provinces.

Keeping quality. Little information has hitherto been available on the keeping quality of gur. The best quality, we are informed, will keep for a year, but much depends on the climate and the locality. We are told that gur will keep in good condition for about a year in the Punjab, for 6 to 8 months in the United Provinces, but only for about 3 months in the humid atmosphere of Bengal. In southern India gur deteriorates after 3 to 4 months in coastal towns but keeps for a longer period in the interior. An excessive use of chemical manures in the cultivation of cane is said to have an adverse effect on the keeping quality of gur.

69. It is difficult to arrive at a correct figure of the average price of gur because the price differs considerably according to quality and varies from district to district and from town to town.

Prices. In the following Table we give the average price for gur in some of the principal markets for the last seven years. For purposes of comparison we have added the average price of sugar in the Cawnpore market.

TABLE IX.—Gur Price per maund of 82 2/7 lbs.

Provinces and market.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	May, 1937.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Madras— Madras	8 0 0	5 7 9	5 5 3	4 9 10	6 2 10	5 3 3	3 9 5	2 1 10
Bombay— Ahmednagar	7 6 0	6 3 0	5 0 0	4 1 3	6 3 6	5 9 0	3 11 5	2 15 9
Bengal— Calcutta	5 6 0	4 15 0	3 11 0	3 15 0	4 10 0	4 5 0	3 8 0	3 5 4
United Provinces— Meerut . . . . .	..	..	..	3 4 7	4 12 8	4 1 6	3 2 6	2 6 9
Punjab— Lyallpur	4 0 0	3 13 0	2 10 0	3 0 3	4 8 5	4 11 4	3 10 1	2 12 6
Bihar— Bhagalpur	4 0 0	3 9 0	2 15 0	2 11 0	3 3 0	4 2 5	2 11 0	1 13 7
Average for eating gur	5 9 9	4 8 7	3 11 3	3 7 4	4 10 5	4 7 9	3 4 1	2 9 0
Sisra Bazar (refining gur) . . . . .	..	..	..	2 8 6	3 0 0	3 7 6	2 10 6	1 5 1
Average Indian sugar price per maund in Cawnpore market.	9 10 0	9 3 0	9 3 0	8 4 0	8 3 0	8 4 0	7 4 0	6 2 0

70. It will be observed that while in 1930-31 the price of gur in Madras, which was highest in India, was Rs. 2-6-3 above the average price, and in Bhagalpur where it was lowest, was Rs. 1-9-9 below the average, the disparity has gradually become less and in 1936-37 was not more than 10 annas. Prices have fluctuated from province to province and from year to year, but since 1935-36 the general tendency has been in the downward direction in all parts of India. During the period 1930-31 to 1936-37 both the acreage under sugarcane and the production of gur steadily increased. Fluctuations in the price of gur appear to have had little influence on the expansion of the area under sugarcane until 1936-37 when the average price fell below Rs. 3-5-0 per maund which in some parts of India was, so far as we can judge, below the cost of production. The estimated acreage for 1937-38 has contracted by 9 per cent. for the whole of India, but it is to be noticed that in some provinces the area under sugarcane still continued to expand, especially in the Punjab and the North-West Frontier Province. The inference to be drawn from the figures of acreage and price is that while the production of gur in India as a whole was perhaps in excess of requirements the production in individual provinces has not yet reached the saturation point.

71. Though overproduction was perhaps the main reason for the drop in prices in 1936-37 there may have been other contributory causes. The previous Tariff Board discussed the question of the correlation of sugar and gur prices and the extent to which sugar and gur were consumed by different classes of the population. Its conclusions appear to us to be in the main correct.

Consumption and Production.

72. It may be stated at the outset that figures for production given in official publications can only be taken as rough estimates as errors are introduced in every stage of their calculation. The whole of the cane that is produced is not converted into gur. It is estimated that 69.5 per cent. of the cane produced is converted into gur, about 18 per cent. is crushed in vacuum pan factories, 3.5 per cent. is used in the manufacture of sugar by indigenous process and about 9 per cent. is reserved for seed, chewing and other purposes.

The total production of gur in India in the last seven years is estimated to have been as follows:—

TABLE X.

Year.	Acreage under cane (000's omitted).	Total production of gur (including gur used in refineries) (000's omitted). Tons.	Year.	Acreage under cane (000's omitted).	Total production of gur (including gur used in refineries) (000's omitted). Tons.
1930-31 .	2,905	2,282	1934-35 .	3,602	3,760
1931-32 .	3,077	2,830	1935-36 .	4,154	4,192
1932-33 .	3,425	3,396	1936-37 .	4,573	4,502
1933-34 .	3,422	3,584			

It will be observed that since 1930-31 while the acreage has increased by 50 per cent. only, the outturn of gur has doubled itself. There are two reasons for this. With the expansion of improved varieties of cane, the yield per acre has increased and the quality of cane being better, the recovery rate of gur on cane has also improved.

73. We give below a Table showing the distribution of production and consumption in the various provinces:—

TABLE XI.

Province or State.	1935-36.				
	Net production.	Imports.	Exports.	Net quantity available for consumption.	Consumption per capita
	Tons.	Tons.	Tons.	Tons.	lbs.
Madras	232,000	10,000	25,000	224,000	8.8
Bombay including Sind and States	226,000	56,000	20,000	256,000	18.7
United Provinces including States	2,037,000	10,000	391,000	1,656,000	72.4
Bihar	287,000	63,000	70,000	280,000	14.0
Punjab including North-West Frontier Province and Delhi.	309,000	128,000	6,000	430,000	27.0
Bengal	432,000	43,000	9,000	504,000	21.3
Assam	31,000	10,000	..	41,000	9.4
Central Provinces and Berar	41,000	46,000	..	87,000	10.2
Mysore	22,000	7,000	18,000	11,000	3.5
Hyderabad	84,000	7,000	..	91,000	13.6
Central India and Rajputana . . . . .	..	96,000	..	96,000	..
TOTAL	3,614,000	..	..	3,476,000	..
Average consumption per capita for All-India.	..	..	..	..	25.8

Most of the gur produced in one year passes into consumption in the same year. The consumption of gur in any province can be calculated on the basis of its imports and exports. Information about movements of gur is incomplete and inaccurate. In the statistics of rail and river borne traffic gur, rab and molasses are classified under one head. Gur is transported for long distances by road, particularly from the United Provinces into Central India and Rajputana and no figures for transport by road are available. It will appear from the Table that unlike sugar, most provinces produce the major portion of gur required for their consumption. Only the United Provinces export gur in substantial quantities. The Punjab (including the North-West Frontier Province and Delhi) and Central India including Rajputana are the principal

importing areas. The consumption figure given by the United Provinces is probably an overestimate because no allowance is made for exports by road, and because the population of Indian States has not been taken into account in arriving at the *per capita* figure.

74. Between 1930-31 and 1936-37 the *per capita* consumption of gur increased from about 18 to 26 lbs. while the *per capita* consumption of sugar increased from 6.1 to 6.7 lbs. only. With an improvement in the

Per capita consumption.

general standard of living and the gradual industrialisation of the country, some increase in the consumption of sugar is to be expected though not necessarily at the expense of gur. In towns and to some extent in villages the spread of the tea drinking habit has led to the increased consumption of sugar. We are told that in villages on special occasions such as marriages and festivals sugar is now used in place of gur owing to the fall in the price. Sugar has also in some places replaced gur in the sweetmeat trade. But the extent of the replacement of gur cannot be large judging by the relative consumption figures. Gur is not only a sweetening ingredient in food and drink, but is itself an article of food. No scientific enquiry has so far been made into its nutritive value, but as it contains both glucose and mineral salts it is probably higher than the nutritive value of sugar.

The extent to which sugar is likely in the future to replace gur depends, in our opinion, mainly on the level of prices. If sugar is cheap some classes of consumers will buy sugar in preference to gur, but if the price of sugar rises they will go back to gur. On the whole, we are inclined to think that an increase in the consumption of sugar is not likely to affect the consumption of gur seriously but that both will expand simultaneously according to the purchasing power of the population.

75. The question of the extent of protection to be granted to the Sugar Industry affects gur only indirectly. The last Tariff

Protection to gur industry.

Board recognised that any system of protection for the Sugar Industry must be very largely concerned with the production of gur and stressed the need of timely action to prevent the development of any organised attempt from outside to invade the Indian gur market. The danger to which it referred, *viz.*, the attempt by Java to manufacture gur in order to capture the Indian market or to import large quantities of low grade sugar for admixture with Indian gur, no longer exists, as imports of low grade sugar and gur have completely ceased since the raising of the import duty in 1931-32 and its application to all grades of sugar without distinction.

No representation has been made to us on the subject of special protection to the gur industry and in present conditions it is not necessary for us to make any recommendation on its behalf.

76. We shall next consider the manufacture of gur from material other than sugarcane. In two distinct regions of India,

Madras and Bengal, gur is still made on a considerable scale from the juice of palmyra, cocoanut or date palms.

Palm juice gur. We understand that some amount of palm juice gur was at one time produced in parts of Bombay, but that the industry has almost died out and that in other parts of India the quantity manufactured is inconsiderable.

In Madras the industry is of importance in three different areas, one in the extreme south, the second in the west centre and the third in the north-east of the province. The number of persons dependent on the industry is estimated at about a quarter of a million. The industry is seasonal, for five months, and those engaged in it find other occupation during the remainder of the year. Of the gur produced one-fifth passes into direct consumption and four-fifths is refined into sugar by vacuum pan concerns of which there are five including one in Travancore State. We understand the Government of Madras instituted a special enquiry into the economics of the industry with special reference to the cost of production. Valuable information was supplied to us by the managing agents of two concerns which refine sugar from palm gur. We ourselves visited two refineries and examined persons directly concerned in the production and marketing of the raw material in the northern area.

The industry is an old established one about which, however, little trustworthy information has hitherto been available. The palm most generally used for the production of gur is the palmyra (*Borassus Flabelliformis*). The tapping of the trees is done by particular castes known by different names in different localities whose hereditary profession is that of toddy drawing. The tapping season begins in December, January or February according to locality and lasts for 5 months. The method of tapping is for the tapper to climb the palmyra, make an incision in the spathes at the top and attach earthenware pots, coated inside with lime to prevent fermentation, into which the juice trickles. The sweet juice thus collected is boiled in iron pans, to some extent clarified and finally solidified into gur.

Generally tappers work in families, the men doing the climbing and the women and children attending to the boiling and solidifying operations. The equipment of a toddy tapper consists of a belt to assist him in climbing, a knife for cutting the spathes and pots for the collection of the juice, besides the pans required for boiling. Sixty trees may be taken as the average number a tapper will lease in a season, but the number varies in different localities. Trees are climbed once or twice a day to collect the juice. One tapper will climb from 20 to 30 trees in a day. In the southern area comprising the Tinnevely district and a small part of Travancore State and in west-central area consisting of parts of Coimbatore and Malabar districts the tappers and their families usually live among their trees all the year round, but in the northern area consisting of parts of West Godavari and Kistna districts, there is a regular migration of tappers during the tapping season. Tappers are usually financed by dealers who collect the

gur and sell to merchants from whom they have received advances. A few well-to-do men, who are not under the necessity of borrowing sell their produce direct to factory depôts. Attempts to form co-operative societies for the benefit of tappers have so far failed. The production of palmyra gur in a season is estimated at 38,000 tons.

Estimates of the cost of production and the net earnings of tappers vary considerably. The main items of expenditure are the rent of trees, equipment for tapping and boiling, and fuel. The quantity of gur produced in a season depends on the number of trees climbed. Estimates of expenditure range from Rs. 20 to Rs. 70 and of production from two to six candies of 500 lbs. in different areas for a season of five months. The price per candy varies from Rs. 13 in the south to Rs. 17-8-0 in the north. Apart from the sale of gur, a tapper's family can supplement their earnings by the sale of palmyra fruit, palmyra leaves and articles made from leaves such as mats, baskets and toys, and palmyra fibre. What allowance should be made for supplementary earnings it is difficult to say, but at the present level of prices the earnings of a family can rarely exceed Rs. 10 a month and may be lower. In any case it is clear that the income of a family can barely suffice to cover the cost of living and that their economic position is far from satisfactory. In 1937 owing mainly to the strengthening of the excise staff to prevent the illicit sale of fermented toddy, but partly also on account of the low price offered for gur (Rs. 17-8-0 per candy) there was a strike of tappers and a temporary cessation of gur making in the northern area. Representatives of tappers whom we examined stated that they were prepared to tap in the next season if the price per candy was raised to Rs. 22 which after deducting middleman's charges would leave the tapper Rs. 19-8-0 per candy.

In Bengal gur is produced from the juice of the date palm and to a less extent the palmyra palm. The industry is of some importance in the districts of Dacca, Faridpur, Jessore, Khulna and 24-Parganas. Not much information is available as to the conditions in which the industry is carried on. We are informed that the tapping of trees is done by ordinary cultivators as an adjunct to their ordinary occupations. An incision is made in the stem of the date palm, from which the juice is collected in earthenware pots. It is then boiled and solidified. The total quantity of gur produced is estimated at 100,000 tons per annum. Most of the production passes into direct consumption but some part of it is converted into sugar by open pan concerns. Palm juice gur is said to find a ready market on account of its flavour.

CHAPTER V.

Cost of Manufacture.

77. We have already dealt with the question of what the price of cane should be in order to give the cultivator a fair share in the benefits of protection and at the same time be a sufficient inducement to supply factories. We now propose to ascertain the fair selling price of sugar. The cost of manufacture is divided generally into three parts, raw material, manufacturing expenses and overhead charges.

We have assumed the price of cane to be 5 annas 6 pies per maund inclusive of freight, commission, etc., for the reasons stated in Chapter III. We have examined the cost of manufacture in different mills and we find that owing to wide difference in their capacities and duration of work the method adopted by the previous Tariff Board of taking the cost of manufacture in a modern well equipped factory of economic output is most suitable. The object of protection is the industrial development of the country and if it is to be successful it should not result in the benefit to a few capitalists and should not lead to the establishment of any kind of monopoly. It is only in conditions of healthy competition that the consumer is assured of a reasonable price. The point, therefore, we have to consider is the adoption of a unit that can work economically and give a fair return on the capital invested. But before we decide what an economic unit should be under present conditions, it is necessary to determine what process of manufacture such a factory should adopt.

78. We give below a Table showing the number of mills with their respective process of manufacture:—

TABLE XII.—*Process of Manufacture of Sugar in the Central Factories in the different provinces.*

Area.	PROCESS OF MANUFACTURE.			
	Double Carboni- tation.	Single Carboni- tation.	Double Sulphi- tation.	Single Sulphi- tation.
Bengal			4	3
North Bihar			13	11
South Bihar			2	2
Eastern United Provinces			17	12
Central United Provinces			10	10
Western United Provinces			15	3
Punjab			4	1
Orissa			7	1
Madras			7	1
Mysore			1	1
Bombay			5	3
Sind				1
Jaora				1
TOTAL	10		78	49

There is very little difference in the process of manufacture between single and double sulphitation or single and double carbonitation and we need not take this distinction into consideration.

79. The difference between sulphitation and carbonitation is that in sulphitation the capital and operative costs are lower, more careful control is required, *i.e.*, less 'foolproof', sugar produced is of lower grade and is more susceptible to damage in unfavourable climatic conditions and the yield is lower by 2 per cent. to 4 per cent. according to the quality of the juice. In the carbonitation process the capital and operative costs are higher, control is easier, *i.e.*, more 'foolproof', the sugar produced is of superior quality and is less liable to deterioration in the monsoon and the yield is higher by 2 per cent. to 4 per cent. according to the quality of the juice. In the former process the juice is not filtered but settled and is likely to be mixed with impurities on the slightest disturbance, whereas in the latter the whole juice is filtered.

Messrs. Begg Sutherland and Company informed us that in the carbonitation process the capital cost is higher by Rs. 50,000 and the operative cost by 4 to 5 annas per maund of sugar. In some sulphitation factories the settled juice is filtered by a 'filteraid' as an extra precaution against impurities so that the quality of sugar may be improved. The extra cost involved is roughly 9 pies per maund of sugar, and the sugar thus produced is about the same quality as that produced by carbonitation. The principal items which raise the cost of carbonitation is the cost of limestone, which has to be used to the extent of about 4 per cent. of the weight of cane, and the cost of coke.

80. One of the main reasons why factories in India have been prevented from adopting the carbonitation process, though it is

admittedly a better and more economical process, is the freight on limestone. The price of limestone is between Rs. 1-8-0 and Rs. 2 per ton whereas the freight is Rs. 12 to Rs. 14, which means that the freight is about 6 to 7 times the cost of the raw material. We have drawn the attention of the railway authorities to this aspect of the question and we hope that it will receive careful consideration. We have made enquiries whether it is possible for a factory to change over from sulphitation to carbonitation without much additional capital cost. Recently a factory of 1,000 tons capacity was so converted with an additional outlay of a lakh of rupees and all the alterations were completed during the off season. The ordinary cost for the conversion of this size of factory is about a lakh and a half but saving in the cost was effected by the partial use of machinery bought in India. A 500-ton factory would require only a lakh of rupees for conversion. But so long as the present difficulties in obtaining limestone and coke at economic prices remain, we must come to the same conclusion as the previous Tariff Board and assume that sulphitation be the process employed for the clarification of the juice in our representative factory.

81. The question next arises as to what should be considered an economic unit suitable to Indian conditions. Since, 1932, 84

Economic unit. factories have been erected with varying capacities and within the last three years many of these capacities have been considerably expanded. The Indian Sugar Mills Association have stated that 500 tons crushing capacity for Northern India and 400 tons for Western and Southern India would be suitable units. Messrs. Begg Sutherland and Company, the Managing Agents of the largest group of factories in India, have suggested 400 tons as the smallest unit. The Deccan Sugar Factories in their reply state that 500 to 600 tons crushing capacity on the major canals and 300 tons on the minor canal would be suitable. The main factors to our mind which should determine the size of a factory are the amount of cane available for milling, economic incidence of overhead charges, transport facilities and access to markets. We give below a Table showing the present capacities of the factories in India:—

TABLE XIII.

Present capacity.	Number of factories reported working in 1936-37.
1—250 tons a day	26
251—500 tons a day	50
501—750 tons a day	34
751—1,000 tons a day	22
1,001 and over tons a day	8
Total	<u>140</u>

It will be seen that the majority of factories are of 500 tons capacity and below. This was also the capacity with which most of the larger factories originally started. We are informed that some of the factories who have extended their capacities have not yet got the full equipment to make them complete and well balanced units. Owing to the impetus given to the industry by the continuance of the revenue surcharge of Rs. 1-13-0 per maund over and above the amount considered sufficient for protective purposes by the Tariff Board, and the low rate at which money was available at the time, a number of new companies were floated by capitalists who produced sugar irrespective of grade and quality which in the past has been variable and poor. The crushing capacity adopted by the previous Tariff Board was 400 tons for the full period of protection. Taking the economic incidence of overhead charges alone, the higher the capacity of a factory the less the cost of manufacture. But in determining an economic unit this factor must be considered in conjunction with other factors such as availability of cane, transport facilities and access to markets in existing conditions.

82. With regard to transport facilities, there has been no marked change since the last Tariff Board reported. From the marketing point of view much depends upon the location of a factory in relation to other factories. If there is no other factory in the neighbourhood it

enjoys a freight advantage in its local markets which enables it to compete with other factories even though its cost of manufacture may be relatively high. In areas where factories are located at considerable distances from one another a factory of 400 tons capacity may constitute an economic unit and even a factory of 50 tons capacity may be able to manufacture at a profit.

83. By far the most important factor in determining the economic size of a factory is the availability of cane in sufficient quantity

Availability of cane. within a reasonable radius. This was the factor which mainly guided the previous Tariff Board when they adopted 400 tons crushing capacity for the full period of protection. At that time cultivators were inclined to make gur rather than sell cane. With the increase in acreage in sugarcane in recent years the total available supply of cane is much larger and more concentrated than it was in 1931. On the other hand, a large number of factories have grown up in close proximity to one another in the United Provinces and Bihar and there is often keen competition for the available supply. On the whole, however, conditions of cane supply may be considered to have definitely improved. Most manufacturers are now able to obtain about 50 per cent. of their cane within a reasonable distance and some 20 factories have their own farms. In Bombay three factories are able to meet the whole and other factories the major part of their requirements from their own farms. Elsewhere the area in the possession of factories is much smaller and can supply only 10 to 15 per cent. of the cane they need. Taking all factors into consideration, we think that a factory with 500 tons capacity would be a reasonable economic unit to adopt for the whole of India.

84. We have next to decide what should be considered a normal period of crushing. The crushing season has started usually in the

month of November, though in one or two mills the date has been earlier, but the duration of season has varied during the last 5 years as can be seen from the following Table:—

TABLE XIV.—*Duration of season.*

Serial No.	Groups.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
1	Punjab	134	89	93	116	142
2	West United Provinces . .	146	119	131	145	171
3	Central United Provinces . .	145	154	143	165	138
4	Eastern United Provinces . .	173	144	139	163	160
5	North Bihar	181	148	129	149	176
6	South Bihar	170	122	142	139	161
7	Bengal . . . . .	..	138	131	165	156
8	Madras	143	95	88	125	123
9	Bombay and Baroda . . .	206	121	217	192	186
10	Mysore . . . . .	..	229	197	279	279

The duration of a season is dependent on the availability of raw material and the economic operating purity of the cane supplies. In 1936-37 the majority of factories started crushing about the 1st December and some of them in the United Provinces and Bihar worked till the beginning of June, as cane was available at a low price and continued to be suitable for crushing in respect of sucrose content and high purity of juice due to favourable climatic condition. We give below two tables showing the dates of starting and closing of factories in 1935-36 and 1936-37:—

TABLE XV.—*Dates of Commencement of Cane Crushing Season.*

Date of starting.	NUMBER OF FACTORIES.							
	SEASON 1935-36.				SEASON 1936-37.			
	United Provinces.	Bihar and Orissa.	All other provinces.	Total for India Season 1935-36.	United Provinces.	Bihar.	All other provinces.	Total for India Season 1936-37. ;
4th—17th October, 1936 . . . . .	..	..	2	2	..	..	5	5
18th—31st " . . . . .	..	..	1	1	..	..	3	3
1st—7th November	5	3	1	9	4	..	..	4
8th—14th "	12	7	1	20	4	1	1	6
15th—21st "	33	14	8	55	15	4	6	25
22nd—28th "	3	7	6	16	8	5	7	20
29th November—5th December, 1936	7	2	3	12	26	18	3	47
6th—12th "	4	..	..	4	7	2	2	11
13th—19th "	1	..	4	5	1	1	1	3
20th—26th "	1	1	1	3	..	..	2	2
27th December to 10th January, 1937	1	1	3	5	2	2	4	8
11th—25th January . . . . .	..	..	3	3	..	..	1	1
26th January—8th February, 1937 . . . . .	..	..	2	2	..	..	2	2
9th February—6th March, 1937 . . . . .	..	..	..	..	1	..	2	3
TOTAL	67	35	35	137	68	33	39	140

TABLE XVI.—*Dates of closing of Cane Crushing Season.*

Date of closing.	NUMBER OF FACTORIES.						
	SEASON 1935-36.				SEASON 1936-37.		
	United Provinces.	Bihar and Orissa.	All other provinces.	Total for India Season 1935-36.	United Provinces.	Bihar.	All other provinces.
31st January—23rd February, 1937	1	..	1	2	1	..	3
24th February—10th March, 1937	3	1	2	6	1	..	2
20th March—31st March, 1937	6	7	8	21	1	..	8
1st April—14th April, 1937	8	14	2	24	8	..	6
15th April—30th April, 1937	23	11	6	40	15	3	4
1st May—7th May, 1937	17	2	1	20	9	3	5
8th May—14th May, 1937	5	..	8	8	9	3	4
15th May—21st May, 1937	..	..	8	3	8	4	2
22nd May—28th May, 1937	1	..	2	3	12	5	2
29th May—4th June, 1937	2	..	5	7	1	10	1
5th June—11th June, 1937	..	..	..	..	1	5	..
12th June—18th June, 1937	1	..	1	2	1	..	..
19th June—30th June, 1937	..	..	..	..	1	..	1
TOTAL	67	35	34	136	68	33	38
							139

It will be seen that the average crushing season for the subtropical region is 129, 150 and 163 days respectively for the last three years as against 148, 161 and 158 days for the tropical region. The average for the three years is 148 days for the former and 155 days for the latter and 150 days for the whole of India. In order to reduce the incidence of overhead charges by the prolongation of the crushing period factories in India generally crush under-ripe cane at the beginning and over-ripe cane at the end of the season. One or two factories in the Bombay-Deccan worked in 1935-36 for as many as 180 days and a factory in Mysore State for 264 days, but these factories are not satisfied with the early ripening types of cane at present grown, because their experience has been that they are liable to deteriorate more quickly than the later ripening varieties. We understand that for this reason the Mysore factory is contemplating a reduction in the number of working days during the next season. A representative of the Bihar Planters' Cane-growers Association is of the opinion that if the crushing season ended about the 20th April, it would be of advantage to all parties. Diseases become rampant and there is loss due to the dryage of cane. Besides if the season is prolonged, the cultivator is unable to grow another crop on the land for 8 months. Experiments are being made to ascertain the most suitable early and late ripening varieties of cane to extend the crushing season. Some success has been achieved in securing types of both these varieties, *e.g.*, CO. 370, 373, 350, 393 as early and CO.331, 421 and 417 as late varieties. But until such time as these new types have been fully tested and established it would not be safe to assume the duration of season to be much longer than 5 months, *viz.*, from the 15th of November to the 20th of April.

85. We give below a table showing the actual number of days factories in India worked for the last three years:—

TABLE XVII.—*Actual number of working days for central sugar factories in India for the last three years.*

Groups.	Number of days actual working.		
	1934-35.	1935-36.	1936-37.
Punjab	76	93	130
West United Provinces	103	124	150
Central United Provinces	120	137	111
Eastern United Provinces	116	146	144
North Bihar	111	129	154
South Bihar	135	133	152
Bengal	94	141	138
Madras	77	104	105
Bombay and Baroda	170	159	150
Mysore	191	264	264

It will be seen from the Table that the average number of days worked in the subtropical area is 108, 128 and 139 respectively for the three years and 122, 135 and 132 days for the tropical area. The year 1936-37 was generally recognised by all as an abnormal year because the factories in the United Provinces and Bihar crushed for a very long period in consideration of the reduction of the price of cane at the instance of the two Provincial Governments. The average for three years is 128 days for the subtropical region and 132 days for the tropical and 130 days for the whole of India. Taking 26 working days in a month in a crushing season of five months we think 130 days as a fair average to adopt as an economical period of working in present conditions.

Having discussed the economic size of a factory and the economic period of working, we next turn to the question of the amount of cane required to produce a maund of sugar. Sugarcane is grown all over India both in concentrated blocks and scattered areas. There are many varieties of cane and the performance of any particular variety may be different in different soils. POJ. 2878 Java's wonder cane has given an yield of 35 tons an acre as against the yield of 50 tons in that very province. CO.213 has given 10 tons in one place as against 21.7 tons in a similar area. CO.331 a type of late variety has given an yield of 24 tons as against 38 tons. Then again HM.320 the Formosa cane of Mysore which has given 39.1 tons has not had much success anywhere else. Some varieties which were giving good yield previously have now been discarded in some provinces and replaced by other varieties. It is obvious, therefore, that the figures of the amount of cane required by different factories for the production of a maund of sugar must differ according to the locality from where they draw their supplies. We give below a Table giving the average recovery of sucrose per cent. in cane for the main sugar producing provinces and the amount of cane required for producing a maund of sugar for 1935-36 and 1936-37:—

TABLE XVIII.

Provinces.	RECOVERY OF SUGAR PER CENT. CANE.		MAUNDS OF CANE REQUIRED FOR PRO- DUCING A MAUND OF SUGAR.	
	1935-36.	1936-37.	1935-36.	1936-37.
United Provinces	9.60	9.65	10.12	10.36
Bihar and Orissa	8.93	9.20	11.20	10.87
Punjab . .	7.87	8.88	12.71	11.26
Madras . .	9.14	9.10	10.91	10.99
Bombay . .	10.47	10.68	9.55	9.36
Bengal . .	8.19	8.61	12.21	11.57
Burma . .	8.90	9.40	11.24	10.63
Indian States .	8.70	9.78	11.40	10.22
Average	9.29	9.50	10.76	10.52

86. It will be observed that in Bombay the sugar recovery is much higher than in most parts of India. The recovery of market-able sugar in one factory is as high as 11·43 per cent. The main reasons for the difference lies in the type and quality of the cane. If the cane is cultivated on a factory or Government agricultural farm the yield and the sucrose content are higher, due to proper care and attention being paid to manuring, supply of water and prompt measures being taken to check diseases and insect pests. The position of the ordinary cultivator is different. His resources are not generally such as to enable him to adopt better methods of cultivation or to lay out a sufficient sum on manures. Nor is he always in a position to give an adequate amount of irrigation. Thus we notice a difference in the sucrose content of canes as shown below:—

Government farm 15 per cent.

Factory farm 13·72 per cent.

Cultivator's field 11·96 per cent.

87. We give below a Table showing the tonnage of sugar per acre in different provinces from which the improvement in the last five years can be judged:—

TABLE XIX.—*Tons of sugar per acre.*

	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
	Tons.	Tons.	Tons.	Tons.	Tons.
United Provinces	1·28	1 36	1 28	1·44	1·46
Bihar and Orissa	·94	1 25	1·32	1·34	1·38
Punjab	·56	·56	·50	·63	·71
Bombay	3·21	2·94	2·59	2 93	2·78
Madras	2·86	2·42	2·52	2·92	2·55
Bengal . . . . .	..	1·39	1·53	1·47	1·47

A factory in Bombay which obtained a yield of 1·86 tons in 1924-25 and 3·51 tons in 1930-31 is now able to get 4·70 tons per acre. In an experimental plot in the Deccan canal area a yield of 100 tons of cane per acre has been obtained which should give at least 11 tons of sugar per acre with a recovery of over 11 per cent. From the Table it will be seen that the average recovery of sugar in the subtropical area was 8·81 in 1935-36 and 9·28 in 1936-37, and in the tropical area 9·95 and 10·02 respectively. Taking the latter figure 11 maunds of cane are required in the subtropical region and 10 maunds in the tropical to produce one maund of sugar. From figures supplied by factories we find that in 1936-37 95 mills had recovery of 9 per cent. and over and 60 mills 9·5 per cent. and over. The Indian Sugar Mills Association are of opinion that unless intensive research is carried out with regard to resistance to insect pests and diseases which reduce the

sucrose content of the cane by as much as 42 per cent. in some areas, no great improvement in the recovery rate can be expected.

88. We give below some interesting figure supplied by Dr. J. H. Haldane, the Chief Chemist of Messrs. Begg Sutherland and Company, showing the loss in sucrose content due to insect pests and disease relating to ten factories which have been published by the Imperial Council of Agricultural Research:—

TABLE XX.—*Loss of sucrose due to insect pest and disease.*

Name of factory.	Diseased cane.	Loss in sugar.	Monthly loss.
	Per cent.	Mds.	Rs.
Marhowrah . . . .	...	3,401	50,406
Ryam	50	14,053	84,318
Barrah	34.6	1,740	28,440
Balrampur	24.3	3,882	23,292
Chanpatia	48.7	6,709	40,254
Samastipur	34.8	6,936	41,616
Purtabpur	31.1	5,035	30,210
Tulsipur	26.3	1,708	10,246
Gauri	17.3	1,157	6,942
		52,621	3,15,724

It will be seen that the loss per month is estimated to be about Rs. 3,56,000 taking sugar at Rs. 6 a maund. For a season of 5 months the loss would amount to Rs. 17,80,000.

89. Another point for consideration is damage by frost. In the Punjab, the western area of the United Provinces and Bombay, the cane crop is sometimes affected by frost.

Loss due to frost. Punjab factories report that in a severe frost 90 per cent. of the cane area is affected and estimate the loss at 50 per cent. A factory in the Meerut Division in the United Provinces states that frost occurs once in 5 years and calculates the loss to be 20 per cent. In a bad year like 1934-35 they had to burn half the cane in their farm. Another factory reports a loss of 80 per cent. of the crop.

In the Bombay-Deccan area the damage to cane by a severe frost in 1929 amounted to 27 per cent. of the crop and in two later years the loss was between 5 and 10 per cent.

90. Taking all points into consideration we do not consider that much improvement in the recovery rate can be expected until the damage by disease and insect pests can be controlled.

Recovery rate. As we shall show later research work in this direction has made little progress. We therefore propose to take 9.5 per cent. as the recovery rate for the whole of India.

91. We have next to consider the manufacturing costs. We have received figures of manufacturing costs and balance sheets from 89 factories for 1935-36 season. Since many factories do not close their accounts until October we have been able to obtain figures for 1936-37 from 72 factories only. We give below a table showing the cost of raw material and manufacturing costs excluding depreciation, interest on working capital and management expenses.

TABLE XXI.

Group.	Number of factories reporting.		Average cost of raw material.		Average of manufacturing expenses per maund of sugar (excluding depreciation and interest on working capital and managing agents' charges).*	
	1935-36	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.
			Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1. Punjab	3	3	4 7 8	4 0 8	1 13 6	1 14 2
2. Western United Provinces .	13	13	4 8 10	3 5 4	1 5 6	1 0 7
3. Central United Provinces .	8	6	3 15 1	3 10 1	1 5 6	1 3 8
4. Eastern United Provinces .	21	12	3 12 11	2 13 2	1 4 0	1 2 6
5. North Bihar	18	16	4 3 1	3 12 11	1 8 3	1 4 2
6. South Bihar	1	1	4 5 5	3 8 8	1 3 3	1 7 6
7. Bengal	4	2	4 1 4	3 9 9	2 8 0	2 0 9
8. Madras	10	10	5 3 8	4 7 1	2 7 3	2 3 8
9. Bombay	8	6	4 9 9	4 7 6	2 0 9	1 10 7
10. Mysore	1	1	4 6 5	4 2 6	1 4 8	1 3 10
11. Central India	1	1	5 13 0	3 14 3	4 5 7	1 2 6
12. Sind	1	1	4 11 8	4 4 10	6 1 6	3 11 9

* Figures under this column include power, fuel and stores, salaries and wages, packing, repairs and renewals and miscellaneous (including insurance, Director's fees, rates and taxes and selling expenses). The figures are averages of the figures reported by the factories.

It will be seen that the figures show great variations from province to province. The reasons are the different capacities of factories in different areas, difference in the quality of cane crushed, differences in the crushing period and variations in the efficiency of manufacture. We have divided the total costs into two-manufacturing costs and overhead charges. Auditors' fees, insurance, selling expenses and rents, rates and taxes are included under manufacture. We have divided the total costs into two-manufacturing capital, managing agency charges and profit are shown under overheads in conformity with the usual practice of the Board.

The cost of raw material has varied from 76.1 to 46.6 per cent. in the last two years according to the quantity of cane crushed and the price paid for it, and the manufacturing charges from 39.4 to 16.4 per cent. according to the quality of cane as judged by the sucrose content and the capacity of the factory.

Roughly 78 per cent. of the total cost is represented by raw material and manufacturing charges. In the economic unit that we have adopted the percentage comes to 52·58 for the raw material and 25·49 for the manufacturing charges.

The cost of production depends upon the sucrose content of cane and the method by which sugar is recovered from it. We give below a table showing the average sucrose content of cane in each province and the amount of sugar lost from the cutting of the cane to the recovery point. We also give a table showing the loss of sucrose in the process of manufacture in India as compared with other sugar producing countries:—

TABLE XXII.—*Sugar balance of Central Sugar Factories in India for the seasons 1935-36 and 1936-37.*

Serial No.	Particulars.	Punjab.		United Provinces.		Bihar.		Bengal.		Madras.		Bombay.		Mysore.	
		1935-36.	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.	1935-36.	1936-37.
1	Sugar in cane . . .	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00
2	Sugar in mixed juice . . .	89-36	89-31	90-25	90-86	90-56	91-42	88-55	89-58	92-77	92-14	89-65	90-67	90-71	90-71
3	Sugar in bagasse . . .	10-64	10-69	9-75	9-14	9-44	8-88	11-45	10-42	7-23	7-88	10-35	9-33	9-29	9-29
4	Sugar as marketable sugars . . .	73-84	79-35	78-41	80-24	78-65	79-69	72-45	78-99	77-83	76-17	79-55	81-05	77-76	77-76
5	Sugar in press cake . . .	0-77	0-62	0-86	0-90	0-86	0-78	1-06	1-03	10-99	10-76	8-66	8-51	8-80	8-80
6	Sugar in final molasses . . .	12-23	8-35	10-09	8-94	10-49	10-18	12-31	10-04	1-00	1-04	0-74	0-72	0-84	0-84
7	Sugar undetermined . . .	2-97	1-09	0-89	0-78	0-56	0-97	2-73	0-48	2-95	4-17	0-70	0-49	8-81	8-81
Number of Central sugar factories to which these figures relate . . .		5	5	50	52	29	31	6	5	6	8	7	7	1	1

Figures not available.

TABLE XXIII.—*Sucrose balance of Java, Formosa, Queensland, Hawaii and Puerto Rico.*

Serial No.	Particulars.	Java, 1933.		Formosa, 1936-37.		Queensland, 1934.		Hawaii, 1934.		Puerto Rico, 1933.	
		100-00	94-72	100-00	97-92	100-00	94-46	100-00	97-56	100-00	94-74
1	Sucrose in cane . . .	100-00	94-72	100-00	97-92	100-00	94-46	100-00	97-56	100-00	94-74
2	Sucrose in mixed juice . . .	94-72	94-72	97-92	97-92	94-46	94-46	97-56	97-56	94-74	94-74
3	Sucrose in bagasse . . .	5-28	5-28	2-08	2-08	5-54	5-54	2-44	2-44	5-26	5-26
4	Sucrose in sugars . . .	86-57	86-57	91-59	91-59	87-87	87-87	89-92	89-92	88-07	88-07
5	Sucrose in press cake . . .	0-69	0-69	0-25	0-25	0-50	0-50	0-24	0-24	0-61	0-61
6	Sucrose final molasses . . .	5-79	5-79	6-47	6-47	5-17	5-17	6-75	6-75	5-72	5-72
7	Sucrose undetermined . . .	1-87	1-87	0-61	0-61	1-42	1-42	0-65	0-65	0-38	0-38

We find that some mills in India have an efficiency equal to Java as judged by their recovery figures but their loss percentage of sucrose is higher as compared with that of Java which is 1 to 1.5.

The recovery of sugar from cane and the cost of manufacture are largely influenced by the quality of the cane over which factories can exercise no control, unless they are in a position to cultivate cane in their own land or land under their control, an ideal arrangement which except in Bombay is exceptional in India. In this respect factories in India are at a grave disadvantage in comparison with factories in Java which are in a position to control the cultivation of all the cane they require and can arrange for harvesting at the time cane has reached maturity and is in the best condition for crushing.

The manufacturing process consists of two main operations, the extraction of juice from cane and the extraction of sugar from juice. The efficiency of juice extraction, known technically as "Milling extraction", is judged by the percentage of sugar extracted in juice on the total sugar originally contained in the cane. An increase in the percentage of milling extraction shows better working of the cane crushing plant.

The efficiency of the extraction of sugar from juice depends on the proper working of the subsequent processes of clarification, boiling and crystallisation, technically known as "Boiling House extraction" and is judged by the percentage of commercial sugar produced on the quantity of sugar present in the juice as extracted by the crushing mills.

The "Overall extraction" is the Milling and Boiling House extractions taken together and represents the percentage of commercial sugar produced on the quantity of sugar present in the original cane.

We give below a Table showing the efficiency of mills in ten provinces and Indian States and the progress made in the period 1934-35 to 1936-37:—

TABLE XXIV.—*Extraction figures for central sugar factories.*

Serial No.	Groups.	Milling Extraction.			Boiling House Extraction.			Over all Extraction.		
		1934-35.	1935-36.	1936-37.	1934-35.	1935-36.	1936-37.	1934-35.	1935-36.	1936-37.
1	Punjab	80.70	80.36	80.32	73.82	82.13	88.84	66.30	73.39	79.35
2	Western United Provinces	80.87	90.28	90.39	82.23	87.22	88.28	73.90	78.74	79.89
3	Central United Provinces	91.04	90.43	91.63	86.26	85.42	86.66	78.54	77.25	79.41
4	Eastern United Provinces	88.75	90.07	90.37	86.85	88.19	88.92	77.07	79.65	80.89
5	North Bihar	91.12	91.63	91.76	83.90	86.44	87.41	76.45	79.21	80.21
6	South Bihar	80.12	80.01	90.79	87.26	87.05	87.52	77.77	78.20	79.46
7	Bengal	90.72	88.55	87.27	82.25	81.81	90.51	74.12	72.45	78.99
8	Madras	94.16	92.64	92.10	83.83	83.63	82.70	78.94	77.58	76.17
9	Bombay and Baroda	89.15	89.44	90.23	88.07	88.37	90.23	78.51	79.04	81.43
10	Myore . . . . .	..	90.71	..	..	85.78	..	..	77.77	..

NOTE.—All figures are weighted averages.

From the above figures it will be seen that for 1936-37 all-India averages are 90.49, 87.90 and 79.52 per cent. respectively. In some of the provinces factories have been able to obtain efficiency of as much as 92.10, 90.51 and 81.43 per cent. Progress in efficiency has been well maintained but there is room for further improvement. We are informed that in some factories in Formosa the figures obtained under the same heads are 98.45, 92.60 and 91.50 per cent. respectively.

From an analysis made by the Sugar Technologist of the increase in recovery (Appendix B) we find that the greater part of the improvement is due to increased efficiency, rather than the better quality of cane. The quality of cane has not improved to the extent that might have been expected and has actually declined in Bombay, North Bihar and South Bihar. This is to some extent accounted for by the increase in the area under ratoon cane which is inferior in quality to plant cane and by the abnormal prolongation of the crushing season in 1936-37. This adverse factor has to a great extent been offset by increased efficiency in milling. The increase in the efficiency of recovery has in Bihar fully and in Bombay nearly made up for the deterioration in the quality of cane.

The purity of mixed juice is another factor in determining how much sugar is recoverable from 100 per cent. brix. The purity of the juice should fall as little as possible during the milling and boiling processes. The purity depends upon the quality of cane used and the length of the interval between the cutting of cane and its milling.

The figures in the following Table show the results in different provinces :—

TABLE XXV.—*Table showing number of factories reporting and purity of mixed juice (true average) for Central Sugar Factories for the seasons 1934-35 to 1936-37.*

Serial No.	Province.	No. of Central Sugar Factories reporting figures of mixed juice purity.			Purity of mixed juice (true average).		
		1934-35.	1935-36.	1936-37.	1934-35.	1935-36.	1936-37.
1	United Provinces .	27	53	52	79.07	79.77	81.33
2	Punjab . . .	2	5	5	72.49	75.48	77.33
3	Bihar . . .	19	23	30	84.03	81.79	79.12
4	Bengal . . .	2	5	5	75.29	75.01	79.40
5	Madras . . .	3	7	8	79.80	80.53	80.55
6	Bombay . . .	2	8	7	84.24	81.64	89.56
7	Mysore State . .	..	1	..	..	84.60	..

Finally, the invert sugar in raw, thin and thick juices is determined and the glucose ratio ascertained. A rise in this ratio means that mills are losing sugar through inversion. The boiling

house efficiency is controlled by the process of clarification. If the p^H value goes below 6.6 which is considered a safe limit for acid reaction, the inversion increases and the percentage of sugar lost in final molasses also increases. In India p^H is higher but not above 7 because that would be alkaline. In view of the high p^H value in India sugar deteriorates more rapidly than in Java and the keeping quality is affected.

92. The first item in manufacturing costs is the cost of fuel. Bagasse which is the residue fibrous matter remaining after cane

is crushed is the main fuel employed in
sugar factories. The quantity of bagasse available depends upon the fibre content of cane. We give below a Table showing the average percentage of fibre content in cane for the different provinces during the last three years:—

TABLE XXVI.—*Fibre per cent. cane.*

	1934-35.	1935-36.	1936-37.
Punjab	13.74	15.97	15.98
West United Provinces . .	14.06	15.06	15.63
Central United Provinces .	15.27	16.60	16.02
Eastern United Provinces .	15.74	15.46	16.36
North Bihar	16.15	16.72	16.80
South Bihar	16.69	16.72	17.94
Bengal	14.68	17.19	17.07
Madras	10.21	13.10	13.04
Bombay	13.88	14.62	14.50
Mysore	13.10	12.60	12.30

It will be seen that in the sub-tropical area the average is 16 per cent. whereas in the tropical it is 13 per cent. The Director, Imperial Institute of Sugar Technology, India, is of opinion that for an efficiently operated factory 14 to 15 per cent. fibre in cane ought to prove sufficient for the whole of its fuel requirements during the working season. He has worked out the details by which it is found that one pound of bagasse produces 2.1 lbs. of steam. The estimated steam consumption including losses is about 60 per cent. on cane; therefore bagasse required for producing 60 lbs. of steam is $\frac{60}{2.1}$ or 28.57 lbs. The quantity of bagasse per cent. cane sufficient for affording the required amount of steam is 28.57 lbs. It is found that on an average 100 lbs. of bagasse contain 50 per cent. of fibre: therefore, 28.57 lbs. of bagasse would contain $\frac{28.57 \times 50}{100}$ or 14.29 lbs. of fibre per cent. cane. Dr. Haldane of Messrs. Begg Sutherland and Company in his oral evidence stated that if the fibre per cent. cane was 17.5 then the whole of the requirements could be met by the use of bagasse as fuel. The Indian Sugar Mills Association are of opinion that 15 per cent. would prove sufficient for the working season provided the right type of boilers and furnaces are installed. We were told by one prominent mill agent that by the substitution of

improved types of boilers he has been able to reduce the cost of fuel in one year from Rs. 30,000 to Rs. 9,000. At present in the sub-tropical area we find that as many as 25 factories have been able to make themselves self-sufficient in fuel and in some there is a surplus of bagasse because the cane mostly used is CO.213 which has a higher percentage of fibre. It must not be forgotten that the higher the fibre content in cane the less generally is the percentage of sucrose as will be seen by comparing the figures of sucrose content as shown in Table XVIII of this Chapter. Dewan Bahadur Venkataraman in his evidence before the Board has stated that research is still being made to evolve a type of cane that will give to the manufacturer all his requirements for fuel without injury to the sucrose content, but it is not possible at this stage to give a definite indication as to the period within which this result can be achieved. Even if bagasse is generally sufficient, the Indian Sugar Mills Association say that a certain amount of fuel will still be necessary during the silent period and at the beginning of the crushing season. Taking this point into consideration and the fact that the fibre content of cane in the tropical region is so low that factories are unable to run on their own bagasse, we think that a small allowance of one anna per maund may be made.

93. The items stores, packing, repairs and renewals and **miscellaneous call for no special comment**, but salaries and wages which together make up about 12 annas in manufacturing expenses require special consideration. Efficiency in production depends to a very large extent on the efficiency of the technical staff employed.

94. Our attention has been drawn to the fact that many mills employ the greater part of their staff only temporarily for the working season and that the salaries paid are not such as to attract the best men. In Java and other countries and in some mills in India, the staff is mainly permanent and the employment of a permanent staff appears to be justified by the results. We are told that a sufficient number of fully qualified Indians are now available and in our opinion the mills which enjoy the benefits of protection should be under an obligation to employ fully qualified men on adequate salaries. In the United Kingdom as a result of experience and organisation some factories during the off season have been able to engage themselves in subsidiary enterprises such as the refining of imported raw sugar, the desugarisation of molasses, the drying of lime waste and the manufacture of fertilisers. We think that factory owners would be well advised in directing their attention towards the development of similar subsidiary enterprises such as the manufacture of sweets which will keep most of their staff employed for the whole year. Even if it is not possible to keep the whole staff on a permanent basis, a reasonable retaining fee should be paid to technical employees whose services are not required during the silent season. We have no doubt that fair treatment in the matter of employment would lead to greater effi-

ciency. An annual hunt for staff and unseemly haggle for salaries every season reflects little credit on an organised industry. We feel strongly on this subject and we would suggest legislation on the lines of the British Sugar Reorganisation Act which determines the principle upon which the beet sugar manufacturer in the United Kingdom shall pay wages to his factory employees. We realise that our proposals involve some additional expenditure under the head 'Salaries and Wages' but we have taken this point into consideration in estimating the cost of manufacture.

95. The other two items under the head 'Salaries and Wages' are non-technical staff and labour. Our recommendations in regard to technical staff apply generally to non-technical staff. In regard to labour, we have been informed that wages paid in factories are often low. The type of labour employed is mainly agricultural, drawn from the villages in the neighbourhood of factories for which the Indian Sugar Mills Association regard a salary of Rs. 7 to Rs. 10 a month as fair. We consider that the minimum wage should be not less than Rs. 10 and have made provision accordingly. This concludes our analysis of the manufacturing costs.

96. We have next to consider the question of overheads beginning with depreciation. The previous Tariff Board estimated the cost of a factory of 400 tons capacity to be Rs. 3.50 lakhs for buildings and Rs. 10 lakhs for machinery which worked out approximately to Re. 1 per maund of cane crushed. Those figures were supplied to the Board by Mr. Noel Deer, the then Sugar Technologist of Messrs. Begg Sutherland and Company. In response to our request the same Company have supplied us with figures for a unit of 500 tons daily crushing capacity which amount to Rs. 3.55 lakhs for buildings and Rs. 12.25 lakhs for machinery, and allowing for the increase in capacity works out at less than Re. 1 per maund of cane crushed. They, however, point out that the figure for buildings does not make sufficient allowance for changes in marketing conditions which necessitate a larger storage capacity and a better type of godown. The Belapur Company, Limited, have also sent us an estimate which is Rs. 4 lakhs for buildings and Rs. 13.58 lakhs for machinery. The Company state that this plant includes certain parts of machinery which are necessary for remelting low grade sugar with the object of producing one superior grade only. In their view the production of one grade will facilitate the standardisation of sugar and we think that it is a step in the right direction but will take considerable time. On the other hand, the Sugar Mills Association say that there is a demand for as many as 5 or 6 grades in the Indian market. We think that in present conditions it is unnecessary to provide for the remelting of low grade sugar. We, therefore, propose to take the figures supplied by Messrs. Begg Sutherland and Company allowing an increase of Rs. 20,000 under buildings for larger and better godown accommodation.

97. Depreciation should be the first charge on earnings in an efficient concern. We find from the balance sheets that some companies have paid dividends to shareholders

Allowance for depreciation.

without making any provision for depreciation or without an adequate provision. The previous Tariff Board on the evidence before them allowed $2\frac{1}{2}$ per cent. on buildings and 5 per cent. on machinery. The reason for fixing the latter percentage was that owing to a short working season the factories had not less than half the year for renewals and repairs to their machinery which added to its life. As the Board had made a sufficient allowance for renewals under cost of manufacture, they thought a lower percentage for depreciation than $6\frac{1}{2}$ per cent. allowed by the Income-tax authorities would meet the case. We are inclined to agree with the view of the previous Tariff Board. We understand that in the United Kingdom the rate allowed under depreciation for machinery is 5 per cent., and we propose to adopt the same rate.

98. The second item under 'Overheads' is 'Interest on working capital'. In every industry a certain amount of money is locked up in raw material, stores and

Interest on working capital.

finished product. The amount varies according to the nature of the commodity. In the case of the Sugar industry the question of raw material and stores does not arise to any appreciable extent. As regards the finished product, production takes place within a period of 5 months but sales are spread over the whole year. Before protection was granted to the industry stocks consisted mainly of imported sugar held by merchants. To-day the position has completely changed. Stocks of imported sugar are negligible and manufacturers have to stock most of the available supply from internal production. The quantity of stocks held by factories is also affected by the fact that merchants are unwilling to hold large quantities in view of the excise duty. The high rate of terminal taxes in a few places like Delhi also deters merchants from keeping large stocks. It is difficult to estimate the average amount of working capital required for the year. The previous Tariff Board thought that it would be enough to allow for one-third of the season's output. The Sugar Mills Association are of opinion that one-half of the season's output is a more reasonable estimate. We agree that this contention is reasonable in view of changed conditions. On the other hand, the rate of interest has decreased since 1930. The Reserve Bank rate is as low as 3 per cent. and some companies are able to borrow at this rate or 1 per cent. above it. The rate varies according to the credit of the managing agents who are generally the guarantors to the Banks in their individual capacities. According to the evidence received the rates vary from 3 to 8 per cent. We think that, on the whole, 5 per cent. would be a reasonable average rate for the purpose of our calculation. Half the average production of our representative factory is 84,048 maunds. The working capital required therefore is Rs. 4,50,444. At 5 per cent. the interest on this would amount to Rs. 22,522.

99. Next item is the management expenses. The Sugar industry in India owes its development to the managing agency system,

Management. but conditions are changing and we notice that there is a tendency to start new concerns under the control of a Board of Directors with a whole-time Managing Director who is paid a remuneration which ranges from Rs. 1,000 to Rs. 2,000 per month. In addition to a fixed allowance for office expenses in some cases the managing agents are paid a percentage on the profits and in a few cases a percentage on sales. The previous Tariff Board thought that a rate of $7\frac{1}{2}$ per cent. on profit was sufficient for the Sugar Industry although other Boards have allowed as much as 10 per cent. as a reasonable allowance for the responsible nature of the work involved. We agree with the previous Tariff Board that a rate of $7\frac{1}{2}$ per cent. is adequate.

100. The remaining items included under the head overhead charges are small and call for no special Cost of production. remark. According to the calculations we have made the cost of production per maund amounts to Rs. 6-13-10.

101. There has been an improvement in the molasses per cent. cane as compared with the period prior to protection. Some of

Molasses. the factories have reached a percentage of 3.25 and in one or two of them it is as low as 2.82 which compares very favourably with the conditions prevailing in Java and other sugar producing countries. But it is still an uncertain factor because large number of factories have to depend upon the ordinary cultivator over whom they have no control. We think it is necessary that the agricultural department of provincial governments should exercise proper supervision in order to show to the growers the exact time to cut the cane. That is the most crucial point from the manufacturers' point of view, as the contents of sugar depend on it. On an average we find that molasses per cent. cane is 3.50 for the whole of India as compared to 4.03 at the time when the previous Tariff Board reported. There remains the question as to whether any deduction should be made from this amount as credit for the sale of molasses. The molasses problem is dealt with in Chapter VIII. It will be seen that the average price realised by some factories for the molasses they are able to sell is 1 anna 5 pies per maund, but that the consumption is at present so much in defect of production that no sale can be found for more than half the quantity produced and in the case of many factories it is no source of profit but actually a cause of expense. The prospects of any new outlet for molasses being found in the near future are uncertain and unless our recommendation on this subject is accepted molasses will continue to be of insufficient value to allow any deduction to be made on this account.

102. The previous Tariff Board considered that nothing less than 10 per cent. per annum will attract capital to the industry.

Rate of profit. In present conditions this rate might appear to be somewhat high, but it is necessary to take into consideration the peculiar conditions of the sugar

industry. The Indian Sugar Mills Association have suggested a rate of 10 per cent. basing their claim on the hazardous nature of the enterprise, the risks of drought, floods, insect pests, the excise duty, the costs of maintenance and the demands of taxation. We appreciate the force of their contention. Unlike other industries sugar factories are dependent on the quality of the raw material they are able to draw from their neighbourhood. If owing to abnormal damage to cane by, for example, frost, disease or insect pests a factory is unable to obtain a sufficient supply of raw material or the quality as judged by the sucrose content is poor, it may not be able to manufacture except at a loss owing to circumstances beyond its control. In a normal year a factory may be able to realise profit of 10 per cent., but in unfavourable years the profit will be less, if there is any profit at all, or there may even be a loss. Over a series of years we doubt whether a representative factory would be able to realise more than 6 per cent. on an average. On the assumption that factories are able to realise a profit of 10 per cent. the total profit of our representative factory will amount to Rs. 1,60,000. After making provision for a dividend of 6 per cent. which we consider a reasonable return for the shareholder and for income-tax and super-tax which at present rates will amount to about Rs. 32,000 the balance available for reserve funds will be about a fifth of the total profits which we think is necessary, if the factory is to remain on a sound financial basis. If, however, the average profit is no more than 6 per cent. on the capital invested the return to the shareholder would be small and it would be difficult to build up a reserve fund. Another point which we cannot ignore is that the previous Tariff Board allowed a profit of 10 per cent. for the whole period of protection. We are reluctant to change this figure in the middle of the protection period. Taking all points into consideration we do not think that an allowance of 10 per cent. profit on the fair selling price is excessive.

We give below a Table which, in our opinion, should be the cost of production of sugar for the whole of India in the light of our above conclusions for the remaining period of protection.

TABLE XXVII.—*Cost of production.*

1. Crushing capacity	500 tons.
2. Number of days of actual work	130
3. Recovery percentage of sugar	9·5
4. Recovery percentage of molasses	3·5
5. Maunds of cane crushed	1,769,444
6. Maunds of sugar produced	168,097
Rs. A. P.	
7. Cost of raw material—Cane at 5 annas 6 pies per maund and 10·5 maunds of cane per maund of sugar	3 9 9
8. Manufacturing charges	1 12 0
Total	5 5 9

TABLE XXVII—*contd.*

	Rs.	A.	P.
9. Depreciation—			
2½ per cent. on Rs. 3·75 lakhs for buildings	9,375	0	0
5 per cent. on Rs. 12·25 lakhs for machinery	61,250	0	0
Total depreciation	70,625	0	0
10. Depreciation per maund of sugar	0	6	8·7
11. Working capital required for half the season's output, 84,048 maunds, at Rs. 5·5-9 per maund	4,50,444	0	0
12. 5 per cent. interest on working capital	22,522	0	0
13. Interest per maund of sugar	0	2	1·7
14. Profit 10 per cent. on the Block capital of Rs. 16 lakhs	1,60,000	0	0
15. Profit per maund of sugar	0	15	2·7
16. Total overheads	2,53,147	0	0
17. Overheads per maund of sugar	1	8	1·1
	Rs.	A.	P.
Cost of raw material	3	9	9
Manufacturing charges	1	12	0
	5	5	9
Overheads	1	8	1·1
	6	13	10·1
Cost of production per maund	9	5	6
Cost of production per cwt.	9	5	6

N.B.—Details of item No. 8 are given in Appendix C.

CHAPTER VI.

Measure of Protection.

103. Under our terms of reference we are asked to examine the measure of production now enjoyed by the industry and report whether it is necessary to continue protection

Imports of sugar. to the same extent or to a greater or lesser extent.

In order to ascertain the amount of protection which the industry needs we have to determine the fair selling price of Indian sugar and see how this price compares with the minimum price at which the imported article can be landed in India and sold. We have already dealt with the question of the cost of production and we now propose to discuss the position with regard to foreign sugar. We give below a Table showing imports of sugar for the last seven years:—

TABLE XXVIII.—*Import of sugar into India from 1930-31 to 1936-37.*

Countries.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
United Kingdom (including Channel Islands).	8,435	22,950	34,897	36,666	16,790	23,447	281
Ceylon (excluding Maldives).	5,724	1,088	77	5	2	102	..
Straits Settlements	468	399	233	153	234	287	127
Hongkong . .	4,221	3,526	1,406	1,762	1,970	2,137	3,103
Poland (excluding Danzig).	1,589	12,992	..	..	4,500	..	..
U. S. S. R. .	42,579	88,129	11,172	..	..	..	306
Netherlands .	622	553	501	1,310	1,794	1,835	1,649
Java . . .	911,768	406,949	327,129	196,827	176,351	150,416	15,022
Japan . . .	1	141	4,039	3,546	2,727	4,779	633
China (exclusive of Hongkong and Macão).	894	1,489	796	1,639	1,891	935	1,907
Portuguese East Africa.	150	..	12,652	18,186	11,088	15,956	..
Other countries .	26,781	18,058	8,839	46,365	6,000	1,264	53
TOTAL .	1,003,177	556,274	401,741	263,712	223,347	201,158	23,075

It will be seen that in 1936-37 the imports have fallen to small proportions. Imports into India classified under the head 'Sugar'

include sugarcandy and cube sugar. A certain amount of high grade household and table sugar and high grade crystal sugar is imported for special class of consumers, like hotels, restaurants, refreshment rooms and aerated water companies on account of its regularity of grain and colour. Soft and moist white sugar is also imported for the manufacture of particular kinds of sweets on account of its adhesive quality. Of foreign countries Java sends the largest amount of sugar into India and has always been the main competitor with Indian sugar. The present difference in price between Java and Indian sugar is about Rs. 3 per maund, but it must be borne in mind that much of the Java sugar imported is of a special high priced quality which cannot be compared with Indian sugar. In the past Java sugar of ordinary quality has come into direct competition with Indian sugar and according to the Indian Sugar Mills Association sells at sometimes below the cost of production. The Association, therefore, desire to emphasise that the ability of Java to enter the Indian market should not be under-rated since Java in the past has been able to land sugar at as low a figure as Rs. 2-6-6 per maund ex-duty.

104. In recent years, since protection was granted to the Indian Sugar industry, the Java authorities have exercised strict control over information regarding their cost of production. We have therefore made every effort to obtain as accurate figures as possible from other sources. The approximate Java first quotations are given in the "Review of Sugar Industry in India" from 13th March, 1934, onwards. The first cost quotation was 6 guilders per 100 kilos on 4th April, 1933, which is equivalent to Rs. 3-8-0 per maund at 63½ guilders per Rs. 100. On 27th March, 1936, the cost quotation was 3-9 guilders per 100 kilos which is equivalent to Rs. 2-10-10 at 54½ guilders per Rs. 100.

There is also some mention of the cost of sugar production in the publication "Netherland Indies" of 28th February, 1937 (copies of which have been supplied to us by the High Commissioner for India at our request), where an approximate figure of 3.75 guilders per quintal (100 kilos) is mentioned as the cost of production exclusive of interest charges.

We give below Tables showing the general progress of the industry in Java and the reduction effected in the costs (1 quintal=100 kilos or 220.4 lbs.):—

TABLE XXIX.

	1925.	1929.	1936.
Number of mills . . .	178	179	39
Cane areas . . .	444,033	486,799	68,515
Harvested, tons . . .	18,683,145	24,140,899	3,881,375
Cane yield per acre, tons .	42.08	49.59	56.65
Sugar per acre, lbs. . .	9,782	13,205	18,966
Sugar recovery, per cent. .	10.43	11.82	15.21

TABLE XXX.—*Cost per 100 kilos in guilders.*

	1926.	1929.	1935.	1937.
Raw material	4.89	3.63	1.38	1.38
Cutting and transport wages .	1.28	1.12	...	...
Cost of manufacture . . .	.74	.65	.67	.67
Packing, upkeep and repairs .	1.69	1.22	.89	.80
Overhead charges, rates and taxes	1.43	1.25	.49	.23
Carriage of sugar	1.56	.45	.30	.30
Selling expenses and depreciation	1.28	1.13	.37	.37
Total	12.87	9.45	4.10	3.75

Converting the cost of 3.75 guilders into rupees per maund at 37 guilders to Rs. 100, we get the figure of Rs. 2-1-8 per maund exclusive of interest on capital and profit. According to the *Indian Trade Journal* the Sourabaya quotation for Java white sugar c. & f. Calcutta on 26th August, 1937, was 7.10 guilders per 100 kilos equivalent to Rs. 3-15-2 per maund. This includes cost and freight but not insurance. We may also mention that the price for home consumption in Java was maintained throughout the year 1936 at about 6 guilders with slight differences according to the ports of delivery and no attempt was made to raise the local price after the devaluation of the guilder. This price includes the excise duty of 2 guilders per quintal. On this basis the cost of sugar including interest on capital and profit and deducting the excise duty would be 4 guilders which converted into rupees at 67 guilders to 100 rupees works out at Rs. 2-3-8 per maund. The cost of freight, landing and clearing charges is at present estimated at 7 annas per maund. Making this addition it would appear that Java can land sugar at Calcutta at Rs. 2-10-8 a maund at a profit.

During our tour we have received useful information from a responsible person attached to a mill in India who has very recently returned from Java. According to him, the cost of cane delivered in the cane area (including depreciation of agricultural machinery, interest on working capital and supervision charges) is at its highest one anna per maund. The sugar selling price for export *ex-harbour* is 3.50 guilders per quintal (100 kilos) equivalent to Rs. 2 per maund or Rs. 2-7-0 per maund inclusive of freight, port and other charges landed in India. This is the lowest limit at which Java can sell sugar *ex-duty* in present conditions, but if the guilder were further devalued even a lower figure might be reached.

Having regard to the reduction in costs effected since the Tariff Board last reported, it is conceivable that within the next 7 years it may be possible for Java to reduce its costs still further. We recommend that the Government of India should take action if the price falls below the landed price calculated by us of Rs. 2-7-0 per maund.

105. Before comparing the fair selling price of Indian sugar with the landed price *ex-duty* of Java sugar for the purpose of

assessing the amount of duty required as a measure of protection, it is necessary first to examine the question whether any allowance should be made on account of the difference in quality of Indian sugar and the amount of freight from factories to ports.

The previous Tariff Board allowed 4 annas a maund for the difference in quality. We are informed by the Sugar Mills Association that quality Java sugar commands a premium of 8 annas over Indian sugar. In other words, consumers would prefer Java sugar to Indian sugar, even if they had to pay 8 annas a maund more. It is, therefore, contended that a quality difference of 8 annas over and above the fair selling price should be allowed.

The quality of sugar is judged by grain, colour, lustre and its ability to keep in good condition. Indian sugar has made great improvement since protection was granted, in colour and grain, and we find that nearly 50 per cent. of the sugar produced to-day is comparable to Java sugar in these two respects. In the matter of lustre, expert opinion indicates that only 3 per cent. of the Indian sugar can stand comparison with foreign sugar and that the difference in price on this account will be between 2 to 3 annas a maund.

As regards the keeping quality of sugar, it is a matter of great importance to the dealer, because if the quality deteriorates before actual sale he incurs a loss. It is generally agreed that Indian sugar is definitely inferior to Java sugar in this respect. We have been informed that the difference in keeping quality in terms of money may be put at 5 to 6 annas per maund. Taking lustre and keeping quality together, the present difference in quality may be taken to be 8 annas a maund. But the quality of Indian sugar is steadily improving from year to year and the improvement was very marked in 1936-37. We do not think, therefore, that we would be justified in allowing a difference of 8 annas per maund for quality for the next seven years. We have ourselves examined a large number of samples of both Indian and Java sugar and we feel, on the whole, that a difference of 5 annas would be reasonable to allow as an addition to the fair selling price.

106. In the matter of freights, since the last Tariff Board reported, the position of the industry has undergone a complete change. The movement of sugar is no longer from the ports to the interior, but from the principal sugar producing areas in the interior to the ports, not because they are ports but because they happen to be important sugar consuming and distributing centres. We propose to confine our examination to the four important ports—Calcutta, Bombay, Madras and Karachi. We give below a Table showing the production and consumption of sugar for the years 1934-35 and 1935-36 of the provinces in which these ports are situated.

TABLE XXXI.

	Tons.	Bombay. Tons.	Madras. Tons.	Karachi Tons.
<i>Production of Sugar—</i>				
1934-35	11,388	20,783	14,511	130
1935-36	24,000	29,650	17,570	1,019
<i>Consumption of Sugar—</i>				
1934-35	140,000	243,000	85,000	20,000
1935-36	158,000	212,000	72,000	22,000

At present none of these provinces is self-supporting and all of them import a fairly large amount of sugar. The question, therefore, arises from where their requirements are to be met. The Indian Sugar Mills Association say that in order that these markets be retained by Indian sugar a freight difference of Rs. 1-1-6 should be taken into account in calculating the rate of protection. Their contention is that at present 83 per cent. of the sugar is produced in the United Provinces and Bihar and freight should be calculated on distances between factories situated in these two provinces and ports.

We give below Tables showing the present freight rates from factories which have built up a market for their sugar in the ports:—

TABLE XXXII.—*Rates of Railway Freight on Sugar from certain Factories to Calcutta.*

Factory Station.	Railway.	Distance, miles.	Freight per maund.
			Rs. A. P.
1. Bihta	East Indian	355	0 8 3
2. Dehri-on-Sone	Ditto	345	0 8 3
3. Gurraru	Ditto	306	0 7 11
4. Buxar	Ditto	411	0 8 9
5. Hasanpur Road	Bengal and North- Western	347	0 9 5
6. Samapur	Ditto	400	0 9 8
7. Lohat Siding (Pandul)	Ditto . . . . .	..	0 9 10
8. Marhowrah	Ditto	394	0 9 11
9. Motipur	Ditto	368	0 9 11
10. Muzaffarpur	Ditto	351	0 9 6
11. Sakri	Ditto	355	0 9 8
12. Samastipur	Ditto	319	0 8 5
13. Sitalpur	Ditto	357	0 9 5
14. Tarsarai	Ditto	351	0 9 6
	Average . . . . .	..	0 9 2

TABLE XXXIII.—*Rates of Railway Freight on Sugar from certain Factories to Bombay (viâ Allahabad City and Naini).*

Factory Station.	Railway.	Distance, miles.	Freight per maund.
			Rs. A. P.
1. Jhusi	Bengal and North-Western.	855	0 13 1
2. Tahsil Deoria	Ditto	1,085	1 0 0
3. Baitalpur	Ditto	1,080	1 0 0
4. Pachruki	Ditto	1,058	1 0 3
5. Sardarnagar	Ditto	1 053	1 0 0
6. Savan	Ditto	1,053	1 0 3
7. Pipraich	Ditto	975	1 0 3
8. Munderwa	Ditto	1,066	1 0 3
9. Mairwa	Ditto	1,039	1 0 3
10. Gauribazar	Ditto	1,044	1 0 0
11. Bhatni	Ditto	1,022	1 0 0
12. Motipur	East Indian	1,135	1 1 0
13. Rampur	Ditto	1,203	0 12 9
	Average . . . . .	..	0 15 8

TABLE XXXIV.—*Rates of Railway Freight on Sugar from certain Factories to Karachi (viâ Cawnpore, Anwarganj and Kuchaman Road).*

Factory Station.	Railway.	Distance, miles.	Freight per maund.
			Rs. A. P.
1. Balrampur	Bengal and North-Western.	1,164	1 0 0
2. Barhni	Ditto	1,206	1 0 0
3. Jhusi	Ditto	1,146	1 0 0
4. Nirmali	Ditto	1,515	1 0 0
5. Walterganj	Ditto	1,191	1 0 3
6. Muzaffarpur	Ditto	1,416	1 0 6
7. Babhnan	Ditto	1,176	1 0 3
	Average . . . . .	..	1 0 1

TABLE XXXV.—*Rates of Railway Freight on Sugar from certain Factories to Madras (viâ Mokameh Ghat, Asansol and Waltair).*

Factory Station.	Railway.	Distance, miles.	Freight per maund.
			Rs. A. P.
1. Hassanpur Road	Bengal and North-Western.	1,311	0 15 9
2. Hathua	Ditto	1,388	0 15 5
3. Jarwal Road	Ditto	1,574	0 15 9
4. Maharajganj	Ditto	1,370	0 15 10
5. Motihari	Ditto	1,302	0 15 6
6. Narkatiaganj	Ditto	1,411	0 15 6
7. Padrauna	Ditto	1,436	0 13 9
8. Samastipur	Ditto	1,280	0 15 8
9. Sardarnagar	Ditto	1,438	0 14 5
10. Savan	Ditto	1,377	0 15 9
11. Semapur	Ditto	1,353	0 15 9
12. Siswa Bazar	Ditto	1,472	0 15 6
13. Tahsil Deoria	Ditto	1,420	0 15 6
14. Tarasrai	Ditto	1,311	1 0 0
	Average . . . . .	..	0 15 7

The average freights to all these ports from factories are as follows:—

	Rs. A. P.
Calcutta	0 9 2
Bombay	0 15 8
Karachi	1 0 1
Madras	0 15 7
Average	0 14 2

The average freight for all ports is 14 annas 2 pies per maund. We have taken into account only factories situated in the United Provinces and Bihar because factories in Bengal, Bombay, Sind and Madras sell their sugar generally in the interior and not in the ports. The cost of production in factories in these four provinces is at present so high as to offset the freight advantage they enjoy. We may, however, mention that the average freight from the factories situated in these four provinces to the ports we have taken as examples is about 9 annas per maund.

The United Provinces and Bihar are the two provinces whose sugar production is in excess of their internal requirements. We have made enquiries as to what percentage of their sugar is consumed in markets within a radius of 200 miles from factories

and we are informed that it is in the neighbourhood of 50 per cent. In these markets they have a distinct freight advantage over imported sugar. At the ports, however, they are at a disadvantage to the extent of the freight given in the preceding Tables.

The previous Tariff Board did not make any allowance on account of freight because the production of Indian sugar in 1929-30 was only 90,000 tons all of which was sold in the interior where factories enjoyed a freight advantage over imported sugar. To-day the position is different. India is able to supply all her requirements and if imported sugar were to replace Indian sugar to any considerable extent, the market for Indian sugar will be disorganised and the price will fall to a level which may have the most serious consequences both on the grower of cane and the manufacturer of sugar. Under the terms of the recent, International Sugar Agreement India is debarred from exporting sugar by sea except to Burma. The question of the export of sugar to Burma and the possibilities of developing any export trade by land are dealt with elsewhere in our report. On the other hand, India has been included in the "Free market" to the extent of 50,000 tons. It appears to us somewhat anomalous that India should be debarred from exporting sugar and at the same time be a "Free market" for imports when its internal production is already equal to consumption.

It, therefore, appears to us of great importance that Indian sugar should not be at a disadvantage in respect of freight in ports and other markets where it is possible that Java sugar could compete. Taking all relevant points into consideration we have come to the conclusion that it is necessary to allow 9 annas a maund on account of freight to provide for the contingency that the price of Java sugar might be reduced to the level which we consider possible.

107. We have now completed our review
Measure of protection. of the items that go to make up the fair selling price of sugar:—

	Per maund.
	Rs. A. P.
Manufacturing cost	6 13 10
Difference in quality	0 5 0
Difference in freight	0 9 0
Total	<u>7 11 10</u>

According to our calculation the lowest price at which Java sugar can be landed in India is Rs. 2-7-0 per maund inclusive of freight and other charges. The difference between the two prices is Rs. 5-4-10 or Rs. 5-5-0 per maund in round figures. Our conclusion, therefore, is that Rs. 5-5-0 a maund or Rs. 7-4-0 a cwt. should be the amount of protection required for the next 8 years. Adding Rs. 2 per cwt. the present rate of the excise duty, the total amount of protection will be Rs. 9-4-0 per cwt.

CHAPTER VII.

Manufacture by other processes.

Manufacture in cane gur refineries.

108. The previous Tariff Board considered the question of refineries and arrived at the conclusion that the refining of gur

was not an economic process. On the other Gur Refineries. hand they pointed out that so long as refineries utilised Indian gur as their raw material, they provided an outlet for cane which the Board regarded as desirable. The number of gur refineries working in 1930-31 was 10 and rose to 27 in 1932-33. Since then the industry has declined and the number working in 1936-37 fell to 9 including 3 refineries in South India manufacturing from palmyra jaggery. 45 central sugar factories had refining plants attached to them but very few of them have been recently worked. The production of sugar by the refineries increased from 36,000 tons in 1930-31 to 78,000 tons in 1932-33 and then fell gradually to 25,000 tons in 1936-37.

109. We shall first consider the question of sugar manufactured from gur produced from cane. From the figures supplied by three

refineries, we find that the average recovery Cost of manufacture for the last two years was between 56 and 59 per cent. on cane gur or 5.6 to 5.9 per cent. on cane as against 5.5 per cent. given by the previous Tariff Board. The manufacturing expenses per maund of sugar, including overheads and selling expenses, have decreased from about Rs. 2-4-0 in 1932 to Rs. 1-10-0 in 1936. The recovery of molasses is about 37 per cent., practically the same as it was in 1932 but the price realised has fallen from about Re. 1 per maund to 4 annas per maund. The sugar produced is generally equal to second grade crushed sugar but fetches approximately 4 annas a maund more than sugar of standard quality partly because it is said to be better as a sweetening agent and partly because it is packed in double bags. The cost of production of sugar depends to a large extent on the price of gur and as the price of gur is not closely related to the price of sugar, the production of sugar from gur has always been something in the nature of speculation. We give below the average price for eating gur in Northern India (average for Lyallpur, Meerut and Bhagalpur markets), the price for refining gur in Siswa Bazar and the price actually paid by two refineries in Northern India including freight, commission charges, etc., during the last three years:—

TABLE XXXVI.

Year.	1934.	1935.	1936.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
Average price for eating gur in Northern India	3 13 9	4 8 2	3 7 10
Average price for refining gur at Siswa Bazar	3 0 3	3 7 6	2 10 6
Average price paid by Gur Refinery (A)	3 7 10	4 0 3	3 4 4
Average price paid by Gur Refinery (B)	3 7 10	3 15 11	3 6 5

We shall first consider what rate of recovery of sugar from gur should be adopted in calculating the fair selling price for sugar manufactured by refineries for the remaining period of protection. The highest recovery in 1935 and 1936 exceeded 59 per cent. There is continuous improvement in the quality of cane and improved methods of manufacture of gur are gradually replacing the older and cruder methods, in consequence of which the gur from which sugar is refined is improving in quality. We therefore consider that a recovery rate of 60 per cent. is not too high an estimate.

Consequent on the increase in recovery rate, the manufacturing expenses will be lowered and we have therefore taken Rs. 1-8-0 as manufacturing and overhead charges. The recovery of molasses has been taken as 37 per cent. and the price as 4 annas per maund. It will be observed that a deduction of 2 annas 6 pies has been made as credit for the value of molasses. The quality of molasses produced by refineries is superior, since it contains more sugar, to that of vacuum pan factories producing sugar from cane. As the total quantity produced by refineries is not large, they are able to dispose of their output without much difficulty. In calculating the profit per maund we have taken the block capital as 8 lakhs of rupees for a factory retining 1,000 maunds of gur daily and the number of working days as 260. We take the cost of the raw material as Rs. 3-5-4, the average price paid in 1936 by two factories, which we consider to be fair with reference to the price of eating gur in Northern India. The cost of production and fair selling price may be estimated as follows:—

TABLE XXXVII.

	Cost of production of one maund of sugar.
	Rs. A. P.
1. Cost of raw material (gur) at Rs. 3-5-4 per maund and a recovery of 60 per cent.	5 8 11
2. Manufacturing expenses including overheads .	1 8 0
3. Profit at 10 per cent. on a block capital of Rs. 8 lakhs	0 8 2
	<hr/> 7 9 1
<i>Deduct</i> —Price of molasses at 37 per cent. recovery and 4 annas a maund	0 2 6
	<hr/> 7 6 7 or
	<hr/> 7 7 0

We have in the preceding chapter arrived at Rs. 6-13-10 as the manufacturing cost for vacuum pan sugar of standard quality. The manufacturing cost of refinery sugar is Re. 0-9-0 higher, but it fetches 4 annas a maund more owing to difference in quality. It is therefore not surprising that the refinery branch of the sugar industry has declined.

Manufacture of sugar by indigenous processes.

110. Sugar has been manufactured in India by an indigenous process from a very early period, but the primitive method of manufacture known as the "Bel-khanchi"

Indigenous process. has now generally given place to hand or power driven centrifugals in khandsars working from rab or open pan concerns.

111. The "Bel-khanchi" method is as follows:—

About 12 bags of rab are stacked in a pile and pressed from the top by a man who stands on a heavy stone. 'Bel-khanchi' method. The molasses are drained off and the contents of the bag are then transferred to a 'khanchi', i.e., a small tank about 3' to 4' in depth with its bottom covered with bamboos, reeds and cotton. On the top it is covered with a layer of 'Siwar'—a kind of grass found in some tanks and rivers. The exact nature of reaction which 'Siwar' on rab has not been determined but on account of its chlorine and iodine content, it appears to have a bleaching effect. The 'Siwar' is renewed several times till the upper layer of sugar has attained sufficient whiteness. The sugar from the top is removed and the treatment repeated for lower layers. This method of manufacture was at one time widely practised in Rohilkhand in the United Provinces and in 6 districts of Bengal. In Bengal, sugar from date palm gur was also manufactured by this method.

The place of manufacture is known as a 'khandsar' and the manufacturer as a 'khandsari'—both terms derived from 'khand' which is the popular name of the sugar produced by this method. A khandsari usually purchases 'rab' from the cultivator but where he possesses landed property he sometimes buys juice which he himself converts into rab. The purchase of raw material in the form of juice is however confined to Rohilkhand. In other parts where sugar is manufactured by the 'khanchi' or the open pan process, the khandsari works direct from cane or rab. The yield of sugar by this method is about 4·4 per cent. on cane which is lower than the yield obtained from the use of centrifugals, but the sugar is said to be slightly better in comparison and fetches a few annas per maund more. This method is, however, dying out as with centrifugals sugar can be produced in much less time and more cheaply.

112. Centrifugals are either hand driven or power driven. As more and more towns are electrified the hand driven centrifugal is being replaced by electric motor driven machines and the place of manufacture is shifting from rural to urban areas. In one town—Shahjahanpur—in Rohilkhand Division there were 60 electric driven against 10 hand worked machines in 1937. The raw material, rab, is broken and then centrifuged. Small quantities of water or a solution of some clarifying agent is sprayed during the process of centrifuging. Sugar is then dried and is ready for marketing.

The average recovery of sugar in a centrifugal concern is about 5 per cent. to 5.5 per cent. as against 4.4 per cent. by the khanchi process. The conditions under which both processes are carried on are far from sanitary as we have ourselves seen in the course of our tour.

113. Where either cane or juice is purchased it has first to be converted into rab and the juice boiling house is commonly known as a 'Bel'. Since the juice is boiled in

Open pan process. open pans the method is known as the "open pan" process. The term "open pan factory" is applied both to the somewhat primitive concern in which a few bullock driven crushing mills, a set of boiling pans and a hand driven centrifugal are all that are required for manufacture, and to an organised factory with power driven crushers and centrifugals and a fairly elaborate arrangement for heating and clarifying the juice. The production varies from 600 maunds to 2,500 maunds of sugar in a season and the capital outlay from Rs. 600 to Rs. 30,000. The recovery varies from 5.5 per cent. in a simple open pan concern to 7 per cent. in an efficiently worked factory.

114. The outturn of molasses by the three methods of manufacture is in the neighbourhood of 5 per cent. Molasses obtained by

Molasses. all three processes and especially the khanchi is richer in sucrose than molasses obtained in vacuum pan factories. It is sometimes used for the manufacture of 2nd sugar by re-boiling and then centrifuging and sometimes converted into gur. 'Molassine' gur is generally inferior, but if fresh cane juice is mixed before re-boiling, the quality improves. It is estimated that the return from molasses is about the same as from molassine gur after allowing for manufacturing costs.

115. The previous Tariff Board considered this branch of the industry as necessary for providing an outlet for cane in areas

Research. where sugarcane cultivation is scattered and where for lack of communications central sugar factories cannot be established. For this reason and because khandsari sugar had an important position in the agricultural system of the United Provinces, the suggestion was put forward that an effort should be made to support the industry. Research work on the improvement of the process of manufacture has been undertaken both by the Agricultural Departments of provincial Governments and by the Institute of Sugar Technology. Khan Bahadur S. M. Hadi had as a result of many years experiments in Bhopal devised a *bel* which was considered by him to be more efficient than the existing Rohilkhand *bel*. The Sugar Committee of the Imperial Council of Agricultural Research decided in 1930 to finance a set of experiments for comparison of the two systems. Experiments were undertaken at Bilari in District Moradabad under the direction of the Sugar Technologist and as a result of his experiments an improved type of *bel* was devised. Experiments were also undertaken in 1932-33 at Shahjahanpur which showed

that the Hadi *bel* was more efficient than the Rohilkhand *bel* if worked under strict control by trained labour, but that both sets were inefficient in regard to fuel consumption and furnace temperature. The new *bel* devised by the Sugar Technologist is not as elaborate as the Hadi *bel* and therefore less expensive, but it is somewhat more elaborate than the Rohilkhand *bel*. An improved furnace devised for it gives a higher fuel efficiency and so reduces the cost of manufacture. It is proposed to test this *bel* at the new research station for open pan manufacture started at Bilari in 1936-37.

The Agricultural Engineer in Bengal has devised an elaborate open pan factory which requires a capital outlay of Rs. 1,000 per ton crushing capacity against Rs. 3,000 per ton required for a vacuum pan factory and from which it is claimed that a recovery of sugar of two qualities of 7·5 to 8 per cent. can be obtained. The actual recovery in the open pan factories in Bengal which have supplied us with figures varies between 5·5 and 6·5 per cent. Under favourable conditions and with trained labour it may perhaps be possible to attain a recovery of 7 per cent. but the figure given by the Agricultural Engineer seems to us rather optimistic. Improvements have also been made in the clarification of juice by filtration and refining by the use of char. It is claimed that in open pan concerns working with this improved method a recovery of 9 per cent. on cane will be possible, but the method has not yet been tried on a commercial scale. The Government of Bombay in 1933 sanctioned Rs. 7,500 for working an open pan factory, the machinery for which cost Rs. 6,300. It crushed on an average 7 tons per day and obtained a recovery of 5·86 per cent. on cane. The somewhat low recovery of sugar was offset by a recovery of 6·51 per cent. of malassine gur prepared from molasses mixed with fresh cane juice.

116. The last Tariff Board estimated the total production of khandsari and open pan sugar at 200,000 tons. The total production during the seven years ending 1936-37 is estimated to be as follows:—

Total production and distribution of khandsari sugar.

TABLE XXXVIII.

Year.	Tons.	Percentage increase or decrease as compared with previous year.
1930-31	200,000	...
1931-32	250,000	+25
1932-33	275,000	+10
1933-34	200,000	-27
1934-35	150,000	-25
1935-36	125,000	-17
1936-37	100,000	-20

With the grant of protection, the total production, it is estimated, continued to increase till 1933-34 when the competition of vacuum pan sugar began to be seriously felt. At the request of the Imperial Council of Agricultural Research, the Government of the United Provinces and the Punjab undertook a census of production with the following result:—

<i>Punjab—</i>		Tons.
1932-33	: : : : : : : :	9,645
1933-34	: : : : : : : :	4,144
<i>United Provinces—</i>		
1932-33	: :	99,254
1933-34	: :	86,913

In 1934 an excise duty of 10 annas per cwt. was imposed on khandsari sugar produced in concerns employing 20 men or more which are classified as factories. In order to evade duty some khandsaris have split up the process of manufacture into two and have located the two halves in different premises. There is little doubt, however, that the industry as a whole has continued to decline. On February 27th, 1937, the excise duty was raised to Rs. 1-5-0 but this figure was subsequently revised to Re. 1 per cwt. with retrospective effect. The additional excise duty and the fall in the price of sugar have had a further discouraging effect on the industry. The following Table of the amount of excise duty collected since 1934-35 is some indication of the extent of the decline in production:—

TABLE XXXIX.

Province.	1934-35.		1935-36.		1936-37.	
	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.
	Tons.	Rs.	Tons.	Rs.	Tons.	Rs.
United Provinces	5,225	65,312	3,791	47,884	2,023	26,038
Bihar	541	6,764	672	8,405	722	10,280
Bombay	168	2,007	4	48	319	4,014
Bengal	119	1,485	320	4,003	480	6,866
Madras	44	552	..	..	..	..
Punjab	37	468	21	259	10	123
North-West Frontier Province .	10	127	3	32	..	..
TOTAL .	6,144	76,805	4,811	60,131	3,554	47,271

In the United Provinces the fall in excise duty amounted to 27·5 per cent. in 1935-36 and to 45 per cent. in 1936-37. Allowing for some evasion of the duty, it may be estimated that the amount of khandsari sugar produced was 30 per cent. less in 1936-37 than it was in 1934-35 and this estimate agrees with the evidence we have received. In Bihar, Bombay and Bengal the figures indicate an

increase in production in open pan concerns. In Madras and the North-West Frontier Province production has ceased and in the Punjab it has fallen to a negligible figure. On these figures we are inclined to think that the total quantity of khandsari sugar produced in the last three years is over-estimated in official publications.

117. We have examined the cost of production of sugar by khandsaris and in open pan concerns in the various provinces of

Present cost of pro-	India and we find that in the last season
duction.	the average costs were as follows:—

TABLE XL.

Khandaris working from rab per maund of sugar.		Khandaris working from juice per maund of sugar.		Open pans per maund of sugar.	
	Rs. A. P.		Rs. A. P.		Rs. A. P.
1. Cost of material—2½ maunds of rab at Rs. 2-3-0 per maund. Average re- covery on cane 4-4 per cent.	5 7 6	1. Cost of raw material, <i>i.e.</i> , juice at Rs. 19 per karda =62½ standard maunds. Average recovery on cane at 5½ per cent. and juice recovery at 57½ per cent.	3 2 10	1. Cost of raw material, <i>i.e.</i> , sugarcane at 3 annas per maund. Average re- covery 6-6 per cent.	2 14 2
2. Cost of manufacture from rab to sugar	0 12 0	2. Cost of manufacture from juice	1 9 0	2. Cost of manufacture from cane including depre- ciation and marketing charges	2 11 8
3. Interest and depreciation	0 1 6	3. Depreciation, interest and marketing charges	0 4 0	3. Interest on working capi- tal	0 1 6
Total	6 5 0	Total	4 15 10	Total	5 11 4
4. Deduct—Return for molasses at 8 annas per maund and recovery of 5-25 per cent.	0 9 5	4. Deduct—Return for molasses at 6 annas per maund and recovery of 4-75 per cent.	0 5 2	4. Deduct—Price of molasses at As. 4-6 per maund. Average recovery of 4-25 per cent.	0 2 6
5. Net cost of production	5 11 7	5. Net cost of production	4 10 8	5. Net cost of production	5 3 10
6. Profit	0 3 0	6. Profit	0 6 0	6. Profit	0 9 0
7. Fair selling	5 14 7	7. Fair selling price	5 0 8	7. Fair selling price	6 1 10

Average fair selling price for the 3 concerns . Rs. 5-11-0 per maund.

In the above calculation we have taken the crushing capacity for khandsari No. 1 at 10 maunds of rab per day, khandsari No. 2 100 maunds of juice and for open pan 450 maunds of cane. The number of working days for all three has been taken to be 80 and the production for the season 320 maunds, 640 maunds and 2,448 maunds of sugar. The capital outlay will be Rs. 600, Rs. 2,300 and Rs. 14,000 respectively. We have allowed 10 per cent. profit on the capital outlay. Taking the price of rab at Rs. 2-3-0 per maund, the price of juice at Rs. 19 per karda or 62½ maunds and the cost of cane at 3 annas per maund, we find that the fair selling price for the three concerns, after deducting the value of molasses, is Rs. 5-14-7, Rs. 5-0-8 and Rs. 6-1-10. The average for the three is Rs. 5-11-0 per maund of sugar. From our enquiries we find that the sugar manufactured by these processes is inferior to the 2nd grade sugar produced by the vacuum pan factories and realises on an average a price about 12 annas less than the first grade sugar produced by the vacuum pan factories, but that last season's stock was actually sold at Rs. 5 to Rs. 5-2-0 per maund. Khandsars and open pan factories work till about the beginning of April and their production is small. Since this class of sugar will not keep long and it is manufactured by small capitalists who cannot keep their money locked up, practically the entire production is sold by the manufacturers by the beginning of July. The price of first grade sugar in the Cawnpur market from the end of March to the end of June was on an average Rs. 6-2-0 per maund ex-factory. As khandsari sugar sells at 12 annas a maund less, the manufacturer has been unable to realise more than Rs. 5-6-0 per maund for his sugar. Adding excise duty at 10 annas and 9 pies per maund to the cost of production which we have estimated to be Rs. 5-5-0 per maund exclusive of profit, it would appear that the khandsari has been selling his sugar at 10 annas 9 pies below cost or Rs. 1-0-9 below the fair selling price.

118. In an earlier Chapter we have calculated the price of cane delivered at factory to be 5 annas 6 pies a maund including the cost of transport. In the case of cane used

Cost of production for the remaining period of protection.

in khandsari and open pan concerns, the cost of transport of cane is negligible since manufacture takes place in proximity to the fields where the cane is grown. Another point for consideration is that the cane grower has often a direct interest in the manufacturing concern and looks for part of his profit from the sale of the manufactured article. In calculating the fair selling price of khandsari sugar for the remaining period of protection we, therefore, propose to take 3 annas 6 pies as the cost of cane which almost coincides with the average cost of cultivation we have estimated for the United Provinces. We have allowed for an increase in the recovery rate in open pan concerns which we consider probable on account of improvements in manufacture and we have consequently made a slight reduction in manufacturing expenses. On the other hand, we have taken a slightly lower recovery of molasses and a lower price for them. Below we give a Table showing the details of the cost of manufacture and the fair selling price:—

TABLE XII.—*Cost of Manufacture per maund of Sugar with Cane Price at 3 annas 6 pies per maund.*

Khandaris working from rab.		Khandaris working from juice.		Open pan concerns.	
Rs. A. P.		Rs. A. P.		Rs. A. P.	
1. Cost of raw material, i.e., rab with 9 maunds of cane=1 maund of rah and crushing charges 8 pies per maund of cane and boiling charges 8 annas per maund of rah. 2½ maunds of rah=1 maund of sugar. Average recovery on cane 4·4 per cent.	7 1 9	1. Cost of juice with extraction of juice from cane at 60 per cent. and average recovery of sugar at 5·5 per cent. on cane. Crushing charges 8 pies per maund . . .	4 11 9	1. Cost of cane. Average recovery 6·75 per cent.	3 4 3
2. Cost of manufacture of sugar from rab . . .	0 12 0	2. Cost of manufacture from juice . . .	1 8 6	2. Cost of manufacture including depreciation and marketing charges . .	2 11 0
3. Interest and depreciation . .	0 1 6	3. Depreciation, interest and marketing charges . .	0 4 0	3. Interest on working capital . . .	0 1 6
Total . . .	7 15 3	Total . . .	6 8 3	Total . . .	6 0 9
4. <i>Deduct</i> —Return from molasses at 7 annas per maund with a recovery of 5 per cent. . .	0 7 11	4. <i>Deduct</i> —Return from molasses at 5 annas per maund. Average recovery of 4·5 per cent. . .	0 4 1	4. <i>Deduct</i> —Return from molasses at 4 annas per maund. Average recovery 4 per cent. . .	0 2 5
5. Net cost of production . .	7 7 4	5. Net cost of production . .	6 4 2	5. Net cost of production . .	5 14 4
6. Profit . . .	0 3 0	6. Profit . . .	0 6 0	6. Profit . . .	0 9 0
7. Fair selling price . .	7 10 4	7. Fair selling price . .	6 10 2	7. Fair selling price . .	6 7 4

Average fair selling price for the three concerns , Rs. 6-14-7 per maund.

Palmyra gur refineries.

119. The Board have been directed to consider whether sugar produced out of palmyra jaggery can bear an excise duty and if so to what extent and whether the concession

now enjoyed by palmyra sugar has any adverse reaction on the development of other classes of sugar. Palmyra jaggery is mainly produced in three different areas of Madras and the southern part of Travancore State. The principal centres of the industry in Madras are Nidadavol of the West Godavari district in the north, Palghat of the Malabar District in the west and the Tinnevelly District in the extreme south. In Chapter VII a description is given of the method and cost of production. The production in the different areas is roughly estimated to be as follows:—

	Candies of 500 lbs.
Palghat	20,000 to 25,000
Tinnevelly	80,000 to 90,000
Nidadavol	50,000 to 60,000
Travancore	10,000

Messrs. Parry and Company have supplied to us the approximate costs of a tapper to produce palmyra jaggery per season in the following three areas:—

TABLE XLII.

Agency.	Production per tapper per season.	Tapper's outlay per season.	Middleman's charges per candy.
	Candies.	Rs. A. P.	Rs. A. P.
Nidadavol (average)	5 to 6	41 8 0	2 8 0
		to	
		68 0 0	
Tinnevelly	2½ to 4	24 4 0	2 3 0
			to
			3 0 0
Palghat	2 to 3	18 10 0	2 0 0

We find from these figures that the cost at Nidadavol is Rs. 10 per candy. At Tinnevelly it is Rs. 7-8-0 and at Palghat Rs. 12. If we add the middleman's charges to all these items we get the cost of production as Rs. 12-8-0, Rs. 10 and Rs. 14 respectively. The price realised by the tappers in these three areas in 1936 was Rs. 17-8-0, Rs. 13 and Rs. 16 less middlemen's charges of Rs. 2 to Rs. 3 per candy.

It is estimated that 20 per cent. of the jaggery produced passes into direct consumption and 80 per cent. is used as raw material by refineries for the manufacture of sugar. The most important of the refineries is the Deccan Sugar and Abkhari Company, Limited, of which Messrs. Parry and Company are the Managing Agents, situated at Samalkot near the Nidadavol area. Its refining capacity is 185 candies per day. In 1936 it worked for 285 days and produced 195,368 maunds of sugar. South of Madras, the East India Distilleries and Sugar Factories, Limited, also managed by Messrs. Parry and Company, manufactures sugar from palmyra jaggery in

the off-season when the ordinary crushing season is over. We understand that jaggery refining is likely to be transferred to a refinery in Travancore State which has been taken over by a new Company with a capital of Rs. 20 lakhs floated in 1937. Two small refineries in Tinnevelly district produce sugar from palmyra jaggery to an estimated amount of 1,300 tons a year. These two refineries have so small a refining capacity that they cannot be considered economic units and the new Company in Travancore has not yet started operations. We, therefore, propose to examine the cost of production in the Samalkot factory.

We are informed that the manufacturing costs of sugar produced from palmyra jaggery do not differ materially from the costs of sugar produced from cane jaggery. The actual average manufacturing cost per maund of sugar manufactured from palmyra jaggery, as given by Messrs. Parry and Company, is Rs. 46 per ton (Rs. 1.69 per maund) and this is stated to be exclusive of silent period charges, selling expenses, depreciation, etc. The average total manufacturing expenses, inclusive of all the above items of a refinery in Cawnpore over a period of five years ending 1936 is Rs. 1.669 per maund. The above figure of Rs. 1.69 per maund appears to be rather high, particularly in view of the fact that the administration and other costs of the Cawnpore refinery are generally on the high side. The figure of Rs. 1.67 per maund may therefore be accepted as applying to the Samalkot refinery. Moreover, the manufacturing cost decreases with the increase in recovery, and the actual manufacturing expenses per maund of sugar produced may, therefore, be taken at Rs. 1.44 ($1.67 \times 56/65$) as the average recovery in the Cawnpore refinery is 56.03, and that at Samalkot may be accepted at 65, though the present recovery is 66.3 per cent. The manufacturing cost inclusive of all other charges may be taken at Rs. 1-8-0 per maund. In 1936 the factory also produced about 10 per cent. sugar from cane jaggery. The extraction of cane jaggery was from 66 to 68 per cent. as compared to 56 per cent. at other similar refineries elsewhere. The price of palmyra jaggery at Nidadavol is Rs. 17-8-0 per candy of 500 lbs. (i.e., 6 maunds) or Rs. 2-15-0 per maund. As $1\frac{1}{2}$ maunds of jaggery are required to produce a maund of sugar, the cost per maund is estimated at Rs. 4-6-6. The allowance for transport charges and transit wastage is Rs. 0.34 per maund; and after allowing Re. 0.1 per maund for railway freight, etc., the allowance due to wastage in transit only comes to Re. 0.24 per maund or 8.3 per cent. on the original weight of gur. This allowance is considered rather high, particularly in view of the short distance of 45 miles. The maximum that could be allowed for wastage in this connection is 4 per cent. In the case of refineries in North India this never exceeds 2 per cent.

The drainings on the weight of original jaggery is stated to be 18 per cent. The only statistics available in this connection are those supplied by Messrs. Parry and Company. The 'drainings'

in a cane jaggery refinery usually form about 6 per cent. on the weight of original gur. Some information available shows that the palmyra jaggery is of inferior quality as compared to ordinary cane-gur and possesses a high ash content. In view of the above the figure of 18 per cent. may be accepted.

From the above calculations the cost of transport and wastage per maund of sugar comes to 3 annas 6 pies and the allowance for loss of freight due to runnings comes to 6 annas 6 pies per maund. We are informed that a factory of this size would require about Rs. 8 lakhs as block capital. We therefore propose to take this figure in the calculation of profit. We have taken 10 per cent. for profit for the vacuum pan factories and we do not think it desirable to draw any distinction between one form of manufacture and another. We, therefore, adopt the same figure for the production of this class of sugar. The additional amount under this head comes to 6 annas 6 pies per maund of sugar. The total cost of production would be as follows:—

TABLE XLIII.

	Per maund of sugar.
	Rs. A. P.
Cost of raw material	4 6 6
Cost of transport and wastage in transit .	0 5 3
Allowance for loss of weight due to runnings	0 9 9
Cost of manufacture and overhead charges	1 8 0
Profit	0 6 6
Total	<hr/> 7 4 0 <hr/>

In the above calculation we have taken the price of palmyra jaggery at Rs. 17-8-0, but in Tinnevely a factory has supplied to us the price of one ton of jaggery as about Rs. 65 per ton as against a price of Rs. 13 per candy given by Messrs. Parry and Company and as the latter figure is more definite, we have based our calculations on this figure.

The cost of production per maund of sugar at a factory in Tinnevely or South Travancore would be as follows taking the same calculations though the quality of jaggery is somewhat superior.

TABLE XLIV.

	Per maund of sugar.
	Rs. A. P.
Cost of raw material	3 4 0
Cost of transport and wastage in transit .	0 5 3
Cost of manufacture and overhead . .	1 8 0
Allowance for loss of weight due to runnings	0 9 9
Profit	0 6 6
Total	<hr/> 6 1 6 <hr/>

We have examined the question of what a fair price should be paid to the tapper for palmyra jaggery as we have done in the case of cane, and we are of opinion that it should be raised by Rs. 2 per candy if sufficient amount is to be provided for the maintenance of the tapper and his family. If we calculate the fair selling price on the basis of Rs. 19-8-0 per candy of 500 lbs. the price comes to Rs. 7-11-6. But if we take the price at Tinnevely at Rs. 15 per candy of 500 lbs. the fair selling price comes to Rs. 6-9-6 per maund.

CHAPTER VIII.

Byproducts.

120. We now turn to the byproducts of sugar manufacture the most important of which is molasses. Molasses is the byproduct

left after the recovery of sugar from the massecuite in the centrifugals. It is a thick, dark substance of which 60 to 80 per cent. is dry matter. Besides salt, colloidal and crystalloid impurities it contains from 30 to 35 per cent. of sucrose and 25 to 27 per cent. of invert sugars and 15 to 25 per cent. of moisture.

121. As in the case of sugar, the production of molasses from vacuum pan factories has undergone a remarkable change during the past seven years. In 1930-31 the production of molasses from cane factories in India

was 48,000 tons, while 102,204 tons were imported. The estimated production for 1936-37 is 404,000 tons and imports have practically ceased since 1935. Taking into account molasses from gur refineries and khandsari concerns, the total production in 1936-37 is estimated at 550,000 tons.

122. Changes in the price level of molasses are also comparable to changes in the price level of sugar. When the Tariff Board

reported in 1931, some factories were able to sell molasses for as much as Rs. 2-12-0 per maund, but the Board recognised that, if the scheme of protection which they proposed was successful, production would rise considerably, competition would increase and prices decline. They, therefore, estimated the price of molasses as Rs. 1-8-0 per maund in the early part and one rupee per maund at the end of the period of protection. Actually the price fell by 1932-33 to the level of 4 annas and from the statistics we have received the average price of molasses in 1937 was 0-1-5 per maund. If we take into account the large quantities of molasses which bring no return but involve expenditure in their disposal, the average value for the whole of India would probably be not more than 8 pies per maund. Generally speaking, the factories which at present realise the best prices and at the same time experience least difficulty in the disposal of molasses are those which have either distilleries attached to them or are situated near the distilleries. The rapidity in the decline is illustrated by the following Table of prices realised by a factory in Bihar:—

TABLE XLV.

Year.	Prices realised.		
	Rs.	A.	P.
1930-31	2	5	0
1931-32	0	15	0
1932-33	0	4	0
1933-34	0	5	0
1934-35	0	2	6
1935-36	0	4	0
1936-37	0	1	7

123. The present uses to which molasses is put are few and the quantity consumed is limited in extent. It is utilised in the manu-

Present uses. facture of alcoholic liquors and methylated spirits and for curing or admixture with tobacco in rural areas, specially in Bengal. In Sir John Russell's report the quantity consumed for these and other purposes is estimated at 175,000 tons. There are about 31 distilleries in British India of which eight are attached to sugar factories and the total production of country, rectified and denatured spirits was 8,553,516 gallons in 1936-37 but there were still imports of 337,426 gallons valued at Rs. 2,75,699 as shown in the following Table:—

TABLE XLVI.—*Imports of Denatured Spirit (Methylated Spirit) into India.*

Year.	Quantity (gallons).	Value Rs.
1932-33	856,788	8,01,222
1933-34	517,584	6,98,251
1934-35	413,429	5,58,224
1935-36	296,405	3,25,462
1936-37	337,426	2,75,699

Sometimes molasses and bagasse mixed together are used as fuel, but special types of furnaces have to be used for this purpose, because the ordinary furnaces are unsuitable. Some quantities of molasses as well as filter mud are used for manuring, but not to any considerable extent. About 100,000 tons are exported. The quantity of molasses for which no use at present can be found is not less than 200,000 tons and may be as much as 250,000 tons. Often it is allowed to flow into an adjacent river or water course, thus polluting the water, or let into pits. Its offensive smell constitutes a serious nuisance to the neighbourhood and is a menace to public health.

124. The Indian Molasses Company whose head office is in Calcutta has been buying molasses for export since 8th February,

Export. 1936. The quantity purchased by the firm in 1935-36 was 97,460 tons and in 1936-37, 100,800 tons. The average price paid in 1936-37 was 1 anna 5 pies per maund—two pies less than the price of the preceding season. Molasses is loaded in tank wagons from factories situated on or near the Bengal and North-Western Railway and the East Indian Railway in Bihar and up to a line east of Cawnpore in the United Provinces and sent to one of the steamer ghats from where it is shipped by steamer to Calcutta. We are informed that it is not profitable to transport molasses from longer distances, in spite of the fact that Indian railway freights for molasses are among the lowest in the world. It has been brought to our notice that the quality of molasses suffers owing to unsatisfactory piping arrangements. Some factories in India use pipes of low diameter for carrying molasses necessitating the use of steam to drive it through in the winter. Steam thins the molasses reducing its brix and also starts inversion of sugar thus causing deterioration in quality.

With the use of wider pipes as in Java, the quality of Indian molasses would be as good as any in the world with the exception of Cuba.

The molasses purchased by the Company is exported to foreign countries where it is used for the production of industrial alcohol, for the manufacture of yeast and as an ingredient in cattle foods. During the last two or three years Cuba has been producing 'high taste' molasses which is nothing else than cane juice evaporated to the density of molasses. As this molasses contains more sugar than 'exhaust' molasses, it is preferred by distilleries as a basis for alcohol. We understand that in Cuba the production of molasses is subsidised by Government. In the face of competition from Cuba the Indian Molasses Company fear a decline in their trade and can hold out no prospect of further development of the export market for Indian molasses.

125. The economic disposal of molasses is one of the most urgent problems which now faces the Sugar Industry. The magnitude of the problem is evidenced from the fact that while the total production of molasses in vacuum pan factories has increased nearly six times, from 69,000 tons in 1931-32 to 406,000 tons in 1936-37, the total value has fallen to less than half from Rs. 18,63,000 (at Rs. 27 per ton) to about Rs. 7½ lakhs on the assumption that 300,000 tons of molasses were sold at 1 anna 5 pies per maund or Rs. 2-6-6 per ton. If molasses in 1936-37 fetched the price of Re. 1 a maund, realised in 1931-32 the total value of molasses would have been Rs. 1,09,62,000 against Rs. 7½ lakhs as calculated above. We are afraid that existing conditions give no hope of a return to old prices, but we would emphasise the importance of factories obtaining a reasonable price in order to reduce the cost of manufacture. It is, therefore, imperative that investigation should be directed towards finding some profitable use for molasses in order that an asset which is potentially of great national value should not be wasted.

126. Experiments on the better utilisation of molasses are being made by a number of individuals and in the Universities of Allahabad and Benares, the Institute of Sugar Technology at Cawnpore and the Institute of Science, Bangalore.

127. Professor N. R. Dhar of the Allahabad University states that the addition to soil of carbon in the form of molasses whether from sulphitation or carbonitation factories leads to fixation of nitrogen. He recommends using 90 to 210 maunds of molasses per acre to be applied two or three months before planting. During this interval weekly ploughing and irrigation of the fields is advised to get satisfactory results. Field experiments at Allahabad and Shahjehanpur show that this method may prove economically feasible if adopted within five miles from the source of supply and the price paid for molasses is not higher than 2 annas per maund. Dr. Dhar has found that alkaline soils are benefited by the application of molasses. This is due to the formation of acids which neutralise the alkali of the

soil. It is not certain, however, whether the effect is temporary or permanent, for some workers in the Bangalore Institute say that the acids are soon destroyed leaving the alkali behind. Molasses is used as a fertiliser to a limited extent in its raw state, but possibly years will elapse before the Indian cultivator can be educated to its use.

A suggestion has been made for the conversion of molasses into a potassic fertiliser which costs little to store and transport and is free from smell. The inventor does not claim for his process a final solution of the molasses problem, but he considers it well worth a trial. He also draws attention to the possibility of making a compound fertiliser by making use of filter press cake which at present is of no value. The potassic products can also be used as a solvent for the bleaching of lac, in chemical works and soap factories.

128. The Science Institute of Bangalore has recently developed a rapid method of converting molasses into a solid product which

Dry solid product as fertiliser, etc.	will not absorb moisture when transported over long distances. This product is claimed to be a good fertiliser, much more efficient in its action than raw molasses and with a much higher nitrogen fixing capacity. If admixed with water, the product turns into a plastic which can be utilised in the manufacture of various articles of utility and value and also for road surfacing. The manufacture of the dry powder is said to be a very simple process, the chemicals required for the purpose being cheap and available in abundance. The estimated price of the dry product is Rs. 10-15-0 a ton which compares favourably with the price of other fertilisers in the market.
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129. Experiments on converting molasses into an insoluble product for use as a road surfacing material have been made in the

Road surfacing.	Technological Institute, Cawnpore, and by the Public Works Department, Mysore.
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Although attempts in the beginning did not meet with success, in 1936-37 a 300' x 10½' road was made by the Institute with an improved composition which withstood the monsoon. There was peeling off at the surface, but the body of the road remained intact. Further improvements have since been made and the improved road composition and seal coating material is the subject of a recent patent application for which sanction from the Government of India has been obtained. The approximate cost of manufacturing the composition after paying interest and depreciation is estimated between Rs. 45 and Rs. 50 per ton (paying 4 annas per maund for molasses) as against Rs. 160 per ton for asphalt used for tar macadam roads. The Sugar Committee of the Imperial Council of Agricultural Research decided that the result of the experiment on the road making material should be published in the Indian Trade Journal and the press in general. A reservation was made that large lengths of roads had still to go through hot weather and monsoon trials, but the short experimental length had already survived this test satisfactorily.

130. The manufacture of cattle feed from molasses is a common method of disposing of molasses in America and in England but

its use in India is still under investigation. The Technological

Cattle Feed. Institute of Cawnpore has made compound feed of different compositions with molasses and a thousand maunds have been sent out for trial at various agricultural farms. Dr. Higginbottom, Principal of the Naini Institute of Agriculture, has also experimented with certain cattle feeds prepared from molasses. The cost of such feeds is, however, found to be practically the same as of other control rations and cattle feed prepared from molasses has to be given in limited quantities of 12 to 16 lbs. a day as a large admixture is not found to agree with cattle.

131. Experiments in the Institute of Science, Bangalore, show that potash which is the chief soluble salt in molasses can easily be separated by chemical precipitation. The resulting sugar syrup is said to be sweeter than the original product. The potash can be sold separately.

132. Molasses can be converted into yeast by the addition of soluble amounts of nitrogenous substances and small quantities of mineral nutrients. The yeast can be easily separated by centrifuging but the recovery is only about 30 to 40 per cent. of what may be theoretically expected. The remaining parts of the molasses is either lost as gas or converted into acid products which cannot be turned into yeast.

133. The Technological Institute, Cawnpore, is experimenting on the conversion of molasses into acetone and acetates, but the economics of the manufacture on a commercial scale has yet to be studied. Information is being collected by the Imperial Council of Agricultural Research on the extent of market with special reference to Governments' requirements and the requirements of the oil companies in India and Burma. Acetone, we understand, is one of the most widely used low-boiling point solvents for cellulose nitrate, cellulose acetate, ethyl cellulose, gums, oils, fats and waxes. It is used in large quantities in the manufacture of artificial silk, for lacquers, celluloid, explosives, paint removers and rosin varnishes.

134. Besides, the use of molasses in the manufacture of glacial acetic acid for the Rayon Industry and acetates there are possibilities, according to the Sugar Technologist, of the utilisation of a considerable amount in vinegar manufacture for use as edible vinegar and for canning and pickling purposes. It is estimated that the production of khandsari molasses in India during 1936-37 was 100,000 tons. Khandsari molasses is considered specially suitable for this purpose as unlike factory molasses, it is free from dark coloured decomposition products due to the presence of calcium salts.

135. Experiments on the conversion of molasses into Butyl alcohol have been made at the Imperial Institute of Sugar Technology and it has been found possible to manufacture it, if molasses is mixed with

Butyl Alcohol.

an equal quantity of starch. Some acetone and ethyl alcohol are also produced during fermentation. There is, however, at present no market in India for this substance and it can only be exported to foreign countries where it has recently been used in large quantities for the manufacture of nitrocellulose varnish and synthetic rubber through butedaine. The economics of the manufacture and the question of possibility of export have not been studied.

136. We have received a scheme for the establishment of an alcohol chemical in United Provinces and Bihar using molasses as raw material. It is pointed out that molasses can be used for producing what are called 'commercial alcohols' which in turn

Alcohol-chemical Industry. can be converted into commercial solvents and plasticizers for use in the manufacture of alcohol products which at present are imported from abroad, *e.g.*, spirit varnishes, nitro-cellulose, lacquers, artificial leather. Carbon-dioxide can also be manufactured from molasses. A scheme on these lines is deserving of further investigation. The Bengal Chamber of Commerce are in favour of investigation regarding the possible use of molasses for other purposes, but according to them "this should not be done unless and until its use as a raw material for the manufacture of power alcohol has been fully investigated and found impracticable or undesirable for some good reason".

137. That molasses is the cheapest and the best raw material for the manufacture of alcohol is universally recognised. Accord-

Power alcohol. ing to the Indian Sugar Technologist, it presents many advantages on account of the fact that the sugar present in the molasses is in a readily fermentable form and, consequently, it does not require any of the preliminary treatments which are necessary in the case of potatoes, grains and other starchy materials used in some parts of the world. There appears to be no technical difficulty in producing absolute alcohol, for we understand there are two or three well-known processes in use in different countries. Absolute alcohol is already being produced in India itself in one factory which we have visited.

138. The Sugar Technologist has furnished the following data on the cost of production of one gallon of rectified spirit and of absolute alcohol from a distillery producing 70

Cost of production of power alcohol. H. L. per day taking the cost of molasses at 4 annas per maund delivered at the distillery.

TABLE XLVII.

	Rectified Spirit.	Per gallon. As. p.
1. Capital expenditure Rs. 2,00,000 to be redeemed in 15 years		0 6.4
2. Cost of molasses		1 10
3. Consumption of steam		0 9
4. Chemical products		0 3
5. Labour and staff		0 6
6. Overhead expenses		0 4
		<hr/> 4 2.4

TABLE XLVII—*contd.*

<i>Absolute Alcohol.</i>		Per gallon.
		As. P.
1. Cost of rectified spirit		4 3
2. Consumption of steam		0 3-12
3. Loss of alcohol		0 0-08
4. Extra capital expenditure to be redeemed in 15 years, <i>i.e.</i> , per gallon		0 2-1
5. Loss of entraining liquid		0 0-23
6. Staff		0 0-20
7. Royalty		0 5-5
		<hr/> 5 2-28

These calculations are based on the assumption that the distilleries will be attached to sugar factories. If the distillery is an independent unit not connected with a sugar factory, the technologist estimates an increase of 2·4 pies per gallon on account of capital expenditure, thus raising the cost of producing absolute alcohol to 5 annas 4·68 pies or say 5½ annas.

Further, we are told that absolute alcohol (power alcohol) can also be produced directly from fermented wash without the intermediate stage of rectifying alcohol at an estimated cost of 4 annas 6 pies per gallon, the same as for rectified spirit.

These estimates are supported by independent evidence and accord with the experience of the Mysore factory where power alcohol is being actually manufactured. As the cost of raw material in 1937 is much less than it has ever been, the production of power alcohol from molasses is a practical proposition, though it may not have been so in the past.

139. Power alcohol is used as a motor spirit after being mixed with petrol in a percentage varying from 10 to 30 in about twenty countries. The experience of European countries is that a mixture of 75 per cent. petrol with 25 per cent. alcohol is superior in performance to petrol.

It is estimated that one ton of molasses will produce 60 gallons of alcohol. If, allowing for present consumption of molasses in tobacco, etc., 300,000 tons are used for this purpose, 18 million gallons of power alcohol can be obtained. The total consumption of petrol has steadily increased and was 100,836,816 gallons in 1936-37. There is thus no difficulty in making use of the total production of power alcohol we have estimated.

As most of the sugar factories are situated at a distance from ports, it is probable that freight charges over long distances may make it impossible for power alcohol to withstand competition with petrol in the neighbouring ports, but power alcohol could be sold in the interior without any difficulty at the same prices and with same duty as petrol. If the petrol producers lower their prices unduly with a view to preventing the use of power alcohol

as a substitute, it would be necessary for Government to take suitable action.

We have next to consider the possible loss of revenue to Government as a result of the manufacture of power alcohol. The Sugar Committee of the Imperial Council of Agricultural Research at its last meeting in May, 1937, adopted the following resolution:—

“ In view of the disappointing results of the molasses export scheme the Sub-Committee requests the Government of India. (1) to issue a limited number of licence for the production of power alcohol for use as motor fuel in admixture with petrol on the condition that producers undertake to pay the full motor spirit excise duty to Government and to comply with all necessary excise regulations, (2) to permit the sale of prescribed mixtures of petrol and alcohol for motor fuel, and (3) to modify the denaturant rules so as to permit the substitution for Pyridine and Caoutchoucine of a denaturant such as crotonaldehyde suitable for use in motor engines.”

The Sub-Committee recognised that all necessary safeguards to protect Government revenue must be provided. The view of the Sub-Committee was that there were areas in Northern India where power alcohol could be produced for motor fuel on an economic basis and that Indian capitalists were willing to invest their money.

If the same rate of duty is levied on power alcohol as on petrol, there would be no loss of revenue to Government in British India, but a difficulty may arise if Indian States begin manufacture on a considerable scale. In Mysore State power alcohol is already produced and other States, we are informed, are contemplating doing so. Even if the same rate of duty is levied the proceeds, it would appear, would go to the States as in the case of the excise duty on sugar. There is thus a danger of considerable loss of revenue to Government, but this is a matter into which we do not feel called upon to enter.

The industry and provincial Governments are united in the view that the manufacture of power alcohol is from the economic point of view the only profitable outlet for molasses in present conditions. We have carefully examined various other schemes for the utilisation of molasses and we find that most of those proposed are still in an experimental stage and are not yet commercial possibilities.

On the other hand, the commercial production of power alcohol from molasses has already been successfully adopted in many western countries. In India itself the experience of manufacturing power alcohol is available and all the conditions indispensable to the starting of a new industry are satisfied, *e.g.*, cheap and abundant raw material, a sufficient supply of labour and a large home market.

The establishment of so important a by-industry can be commended as a step in the direction of India's industrialisation and as an outlet for Indian capital and a means of remedying the unemployment problem. We recommend, therefore, that permission

be accorded for the manufacture of power alcohol in India, on the understanding that it bears the same rate of duty as petrol.

140. The present import duty on molasses is $31\frac{1}{4}$ per cent. *ad valorem* and it has been in existence since September, 1931.

From the evidence received it does not appear to have adversely affected any industry. The duty under present conditions is inoperative since molasses in India is obtainable for practically nothing and imports are out of the question.

141. The second important by-product is bagasse which is the residue fibrous matter remaining after cane is crushed. It is at present used as fuel for generating steam in factories.

The Indian Sugar Mills Association suggest that if a more profitable use for bagasse can be found some factories will prefer to run on coal or other fuel. Experiments are being made at the Research Institute, Dehra Dun, on the utilisation of bagasse for the manufacture of packing paper, inferior grades of paper and paper boards including insulation, wall and fibre boards. A grant of Rs. 15,000 has been provided by the Imperial Council of Agricultural Research for this purpose in 1937-38. It is said that approximately $1\frac{1}{4}$ to $1\frac{1}{2}$ tons of air dry bagasse will turn out a ton of paper board. The cost of a 3,000 tons factory is estimated to be Rs. 6 to Rs. 7 lakhs. It may be added that in Louisiana (U. S. A.) paper boards are actually made from bagasse which is obtained from Cuba.

We are told that in the reconstruction of Quetta Rs. 2 to Rs. 3 lakhs worth of paper boards were imported. These boards are in some respects better than wood boards and can withstand white ants. The following Table of imports of paste boards, mill boards and card boards of all kinds shows that in 1936-37 they amounted to 485,009 cwts.

TABLE XLVIII.—*Total Paste Board, Mill Board and Card Board of all kinds.*

Year.		Quantity.	Value.
		Cwts.	Rs.
1931-32	. . . . .	275,543	26,00,399
1932-33	. . . . .	419,543	37,14,212
1933-34	. . . . .	317,042	27,72,684
1934-35	. . . . .	416,954	33,38,714
1935-36	. . . . .	496,926	36,56,434
1936-37	. . . . .	485,009	35,40,428

Other possible uses to which bagasse may be put are the manufacture of purified cellulose and artificial silk.

More research work and the study of its commercial possibilities are required to see if bagasse cannot be used to greater advantage, at least in the case of mills situated near the coal mines.

In this connection we understand that the Rhotas Sugars, Limited, is starting a paper factory by the side of their sugar factory and propose to use bagasse as part of the raw material.

142. In the Benares Hindu University
Bagasse Ash. experiments show that bagasse ash can be used for the manufacture of glass.

Bagasse ash is already being utilized for this purpose by the Isabella Sugar Company in the Philippines which has built up an extensive business in wines and spirits, and fertilisers, manufactured from products of sugarcane. The subsidiary products department of the Company manufactures bottles and glasses from bagasse and cane waste and turns out about 2,000 bottles daily.

We think, therefore, that research work on the utilisation of bagasse for purposes other than fuel should be continued.

CHAPTER IX.

Marketing.

143. In consequence of changed conditions in which, correspondingly with an increase in internal production, imports of sugar

have shrunk to small proportions, the marketing problem of sugar in India has entered upon a new phase. The movement of sugar is no longer mainly from ports to interior, but from the principal sugar producing areas in the interior to the ports, not because they are ports but because they happened to be important sugar consuming and distributing centres. The focus points of the industry may, therefore, be said to have shifted from Calcutta and Bombay to Cawnpore, the centre of the main sugar producing area in the interior.

At the time of the last Tariff Board's report, no particular marketing problems called for their attention or for any special recommendation. We assume, therefore, that up till 1931 marketing arrangements were considered on the whole satisfactory.

In 1930 three quarters of the sugar consumed in India was imported, mostly cane sugar from Java and to a less extent beet sugar from Europe. The import business was in the hands of firms with head offices in the principal ports who bought through their branches or agents abroad and sold to merchants on a c.i.f. basis. Merchants, in their turn, sold to dealers, the ultimate purchaser taking delivery at port and paying import duty and landing charges. 'Forward' business was mainly in Java sugar bought and sold on the basis of well recognised Dutch Standards. In this period movements of sugar were from ports to the interior, Indian made sugar finding its market in the neighbourhood of producing centres.

With the rapid expansion of Indian sugar manufacture consequent on the grant of protection, it became necessary for the trade to adapt itself to changing conditions and merchants began to open offices upcountry for convenience of business in Indian sugar. In 1932-33 the production of Indian sugar for the first time exceeded the quantity imported and by 1933-34 Indian sugar was beginning to compete with foreign sugar at the principal ports.

In September 1935 the outbreak of the Abyssinian war led to some speculative buying of commodities including sugar. What effect the losses incurred by speculators had in the course of events is a matter of dispute, but it is agreed that the beginning of marketing difficulties dates from the early part of 1936.

144. During this four years preceding 1935-36, the total available supply of Indian and imported sugar remained at steady level allowing for a normal increase in consumption. In 1935-36 for the first time the increase of internal production was not offset

The beginning of a marketing crisis.

by a corresponding decrease in imports, on account of speculative purchases of foreign sugar on the outbreak of the Abyssinian war. With a large increase in the visible supply of sugar and the prospect of a considerable increase in internal production signs of nervousness appeared in the market and in the last quarter of 1936 selling pressure was in evidence. November 1936 may be taken as the beginning of a crisis, which lasted until the end of June, 1937, marked by an almost continuous fall in prices and eventually by panic selling on the part of factories competing with one another to unload their stocks at any price.

Two events in this period require mention. The first is the announcement of an additional excise duty of 8 annas a cwt. at the end of February 1937. *Primâ facie* it might have been expected that the effect of the additional duty would have been to raise prices. Actually attempts to lift prices failed after a few days and they quickly resumed their downward course. Two reasons are assigned for this unexpected result. Firstly, some factories, in anticipation of the additional duty, made special arrangements to remove as much of their stocks as possible outside their premises in order to escape the additional payment as is evident from the abnormal shrinkage in factory stocks during the second fortnight of February. The large quantity of sugar thus suddenly thrown on the market had naturally a depressing effect on prices. Secondly, the imposition of the additional duty in the middle of the manufacturing season accentuated the already general feeling of nervousness in the market and placed factories in a difficult position owing to the refusal of buyers to take delivery of sugar on the new terms.

The second disturbing factor in the situation was the decision of factories in the United Provinces and Bihar to prolong their crushing season in consideration of a reduction in the price of cane, which was interpreted to imply an increase in the production of sugar at a lower cost. However necessary the prolongation of the season may have been in the circumstances, its effect on the market was unfortunate and by the end of June the price of Indian sugar touched the unprecedented low level of Rs. 6-1-6 per maund for Cawnpore Crystal Sugar No. 1 and under Rs. 6 for other qualities.

145. Such was the position when towards the end of June rumours reached the market that a selling Syndicate had been organised by the Indian Sugar Mills Association to assist in the carrying of stocks over the remainder of the season. In July

Formation of Selling
Syndicate.

the fixation of minimum selling limits and quotas of supply for the 92 factories which had joined the Syndicate had the effect of steadying prices and what was even more important, of restoring some of its lost confidence to the market. In October the selling Syndicate announced the continuance of its operations over the following season. Meanwhile a Conference had been arranged by the Governments of the United Provinces and Bihar with representatives of the industry with a view to the fixation of minimum cane

price for 1937-38. The announcement of the fixation of an irreducible minimum price of 5 annas 3 pies per maund for 'gate' cane and 5 annas for 'rail' cane was taken to imply the necessity for a corresponding rise in the price of sugar. By November 1937 prices had recovered to Rs. 6-14-0 per maund but the market was in a state of uncertainty owing to doubts as to the future policy of the selling syndicate.

We have found it advisable to trace in some detail the course of events since October 1936 on account of the bearing it has on the general problem of sugar marketing. For an understanding of other causes which contributed to the development of the crisis, a preliminary description is necessary of the conditions in which Indian sugar is marketed, including storage of sugar, financing of stocks and the relations between manufacturers and merchants.

146. During the period when India was mainly dependent on imported sugar the bulk of the stocks were held at the ports of entry and comparatively little in the interior. With the increase in Indian production and the decrease of imports the position has been gradually reversed. Comparatively little sugar is now stored at ports and the bulk of the stocks remains with factories until they pass into consumption. The manufacture of Indian sugar is normally limited to a period of five months, but consumption is spread more or less evenly over the whole year. At the beginning of the manufacturing season stocks are at their lowest but as the season progresses they gradually accumulate and reach their maximum about the end of April. From May onwards stocks again begin to diminish, but a proportion remains in storage during the monsoon period which in most parts of India extends from June to October.

In the period when the quantity of Indian sugar manufactured was comparatively small and most of it passed rapidly into consumption, no particular difficulty arose. But with the expansion of production to the level of consumption questions of storage and keeping quality became of increasing importance. During the last three years most of the factories who have supplied information have increased the capacity of their godowns, sometimes to double the original extent. Some steps have also been taken to improve their suitability for storage during the monsoon period. We have inspected godowns at factories as well as godowns at ports and up country marketing centres and find that in many cases there is room for considerable improvement. A few experiments have been made on the flooring of godowns, methods of stacking sugar, ventilation and regulation of temperature, but in our opinion there is a need for research work by the Government Technological Institute in co-operation with factories.

147. As regards the keeping quality of Indian sugar most factories are alive to the importance of improvement. There was a distinct improvement in the 1936-37 season, but the fact remains that most of the Indian sugar produced is still inferior in quality to

Java sugar. The comparatively rapid deterioration of Indian sugar in storage is undoubtedly one of the causes of marketing difficulties and disagreements between merchants and manufacturers which have been much in evidence with the fall in the price of sugar which began in 1936.

148. Another difficulty in the marketing of sugar to which our attention has been drawn is the delay in delivery after despatch from factories. The main movement of Movements of sugar. sugar is by rail. Some quantity is transported by steamer but comparatively little, we are informed, by road over long distances. Representations have been made to us both by manufacturers and merchants as to the difficulty of procuring railway wagons and as to the unsuitability of the wagons employed. Complaints have also been made of the inadequate arrangements made at transshipping stations for the protection of sugar bags against damage by rain and of the lack of facilities for loading and unloading.

From the point of view of factories the main difficulty is the shortage of wagons in the busy part of the season. It has been pointed out to us that this shortage is mainly due to the fact that factories are anxious to get as much of their stocks as they can out of their godowns if possible before the advent of the monsoon. If the issue of sugar from factories were more evenly regulated over the whole year in accordance with the average demand for consumption, many of the difficulties would disappear.

The representation of the Indian Sugar Merchants' Association is that the loss resulting from damage in transit falls mainly on merchants and dealers because both factories and railways disclaim responsibility for sugar that arrives in damaged condition. We are informed that sugar in transit is liable to sweat apart from damage that may occur during loading and unloading or in the course of transshipment. It is, however, agreed that in 1936-37 the extent of damage was less than in previous years, partly because the general quality of sugar was better and partly because the wagons supplied were more suitable. We do not consider it necessary to discuss these matters at length, as the Indian Sugar Mills Association have made their own representations to Railway Companies.

We pass next to a consideration of the question of the financing of stocks.

149. Stocks held at ports and important marketing centres in the interior are estimated to be between 40,000 and 50,000 tons. Fluctuations in stocks. Figures of stocks with factories are incomplete but it may be estimated that in 1937 a maximum of about half a million tons was reached which fell by the middle of November to about 140,000 tons. Little information is available as to the extent of 'invisible' stocks, i.e., stocks held by small dealers and retailers; all that can be said is that in a rising market they tend to increase and in a falling market to decrease, but the variations are not likely to be large.

Uncertainty as to the statistical position and exaggerated estimates of the carry over of stocks from the 1935-36 season undoubtedly tended to increase the general feeling of nervousness in the market which developed in the latter part of 1936.

150. The financing of stocks held by factories is usually arranged by means of advances from banks or other agencies on the

Financing of stocks. security of the stocks. Advances by banks to approved customers may be at 1 per cent. above the Reserve Bank rate, but in other cases will be at higher rates. Factories who obtain advances from agencies other than banks may have to pay at 6 to 8 per cent. In a falling market weak holders find difficulty in obtaining advances and may be forced to sell at any price they can get. The inadequate financial backing of some factories which sprang up in the boom period when profits appeared easy to make was undoubtedly the cause of a good deal of forced selling and the consequent general disturbance of the market in 1936-37.

151. Sales of sugar by factories to dealers are sometimes direct **Selling arrangements.** on a f.o.r. basis but usually through selling agents and brokers who are paid commission varying from $\frac{3}{4}$ per cent. to $1\frac{1}{2}$ per cent., but generally 1 per cent.

152. In connection with the storage of sugar, it has been represented to us that the **Standardisation of Indian sugar.** marketing of Indian sugar is rendered difficult from the point of view of the merchant not only by its general inferiority in quality but also by the multiplicity of grades manufactured and the lack of standardisation. A set of Indian standards based on colour and grain has been prepared by the Government Technological Institute in consultation with merchants and manufacturers which is regarded as suitable to Indian conditions. But though many factories make use of these standards for the purpose of grading their own sugar three factories only have so far sold their sugars on the basis of Indian standards. Old established factories prefer to sell on the basis of their own marks and some new factories are still unable to manufacture according to these standards. Further, it is contended that owing to a want of uniformity in quality, the standard contract form is one-sided and works unfairly for merchants more particularly in respect of the clauses relating to quality and arbitration in the case of disputes. Consequently many merchants have been obliged to withdraw from 'forward' business and to limit their purchases to their immediate requirements.

Into the details of the disputes between the Indian merchants and Indian Mills Association and the attempts made to arrive at a settlement we do not propose to enter. We cannot but regard it as unfortunate that the two parties have been unable to arrive at a satisfactory solution of the matter in the general interest of the industry. We should add that in Southern India where a selling-arrangement between factories has been for sometime in existence,

disputes between factories and merchants or dealers have been of very rare occurrence.

In the matter of standardisation of Indian sugar it is generally agreed that standardisation is desirable but doubts have been expressed as to whether the time is yet ripe. On the whole we are inclined to think that the difficulties are exaggerated and are fast disappearing. Factories are coming to realise the desirability of reducing the number of grades of sugar they manufacture. 25 per cent. of factories now produce only one grade of sugar, 43 per cent. two grades and others are moving in the direction of a reduction in grades. As to whether Indian sugar should be sold on one standard similar to Dutch Standard 25 and above or on two or more standards we express no opinion, since the matter is one on which the industry should be able to arrive at an agreement given goodwill on the part of all parties concerned.

153. If Indian sugar is standardised it has been suggested that the establishment of 'Futures' or 'Terminal' markets might be of assistance to the industry in facilitating 'hedging' operations, but it is generally agreed that, until Indian sugar is standardised, the suggestion is premature.

154. In the preceding paragraphs we have stated the causes which contributed towards the development of the crisis in 1936-37.

The immediate cause was the fear of a glut of sugar in the market as a result of the large increase in the available supplies in 1935-36 and the prospect of a further large increase in the manufacture of Indian sugar in 1936-37. A fall in the price of sugar was the natural consequence but the statistical position did not, in our opinion, warrant the slump that ensued. Though 'visible' stocks had increased they had not reached unmanageable proportions. Had a selling organisation come into existence in 1936, it is unlikely that it would have experienced any more difficulty in carrying stocks than the sales syndicate experienced in 1937.

155. Looking to the future the position of the present selling syndicate must be regarded as somewhat uncertain so long as a number of factories are unwilling to co-operate. We understand

that the first central selling organisation formed in Java in the year 1918 known as the United Sugar Producers Association failed on account of a similar lack of co-operation and the eventual defection of some of its members. In 1932 the intervention of the Government was necessary for the formation of a new organisation, the Netherlands India Association for the sale of sugar, popularly known as NIVAS, which began to operate from January 1933. This organisation embraces all concerns manufacturing sugar except by the indigenous method and has a monopoly of the sale of sugar. We understand that the Directorate consists mainly of factory owners, but the Java Bank is also represented and the President is nominated by the Government which exercises a power of general control and veto.

The Indian Sugar Mills Association in their evidence have stated that they favour a central organisation of manufacturers with a statutory power to fix minimum selling limits which will be binding on all factories. There are objections to the grant of statutory powers to a body which represents one interest only and the apprehensions of undue interference in the day to day business of the selling organisation if this organisation is constituted on the lines of NIVAS seem to us to be exaggerated. In the interest of the consumer some measure of State control is in our opinion essential.

Control can be exercised either from inside an organisation on the analogy of NIVAS in Java or from outside on the analogy of the Sugar Commission constituted under the British Sugar (Re-organisation) Act of 1936. Under this Act the Sugar Commission consisting of a Chairman and not more than four other salaried members has very wide powers of control over the British Sugar Corporation into which existing sugar factories were amalgamated. The main functions of the Corporation relate to the purchase of home grown beet, the determination of acreage every year and to the production and marketing of white sugar. The main duties of the Sugar Commission are defined as the keeping under review the growing of sugar beet and the manufacture, refining, marketing and consumption of sugar and of advising on other matters referred to them. A duty is also imposed on the Commission to report as to the rates of excise duty with regard to the need for avoiding undue dislocation of the industry. Additional functions are the submission of a scheme making provision for the encouragement, promotion and conduct of research and education in matters affecting the growing of beet or the manufacturing, refining, marketing or consumption of sugar. With a view to the prevention of inefficient or uneconomical refining and marketing of sugar, power is given to submit a licensing scheme of registered refineries. Other provisions of the Act relate to the maintenance of wages and conditions of employment in the industry at a certain standard and to penalties for failure to supply information to the Commission.

Since some kind of central organisation under State control has been found necessary in Java, England and other countries, we cannot but think, in the light of recent happenings, that the marketing side of the industry in India is equally, if not more, in need of rationalisation. It has been pointed out that the logical consequence of the fixation of minimum prices for sugarcane is the stabilisation of the price of sugar; otherwise, if the selling price of sugar falls below a certain level, factories may find it impossible to continue manufacture, since the cost of manufacture is mainly determined by the price of cane. Without going so far as to suggest the fixation of sugar prices by direct State action, though there are precedents for this procedure in other countries, in our opinion some form of State control is in present conditions essential both in the public interest and the interest of the industry itself.

CHAPTER X.

Consumption and Production.

156. For the correct estimation of the consumption of sugar it is necessary to know the quantity of net imports (imports *minus* exports), the quantity of internal production and the extent of stocks held at the beginning and end of the period selected. Statistics of net imports are available but the figures of internal production are based to some extent on estimates and, as we have already shown, there is considerable uncertainty as to the amount of stocks and invisible supplies. Estimates of the consumption of sugar in India in any particular period can, therefore, make no claim to exactitude.

We give below a Table showing the estimated consumption of sugar from 1930-31:—

TABLE XLIX.—Consumption of sugar in India.

(November to October.)

Particulars.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Initial Stock—							
(1) in ports	37,100	31,150	19,176	9,057	21,630	11,189	23,684
(2) in principal inland markets* . . . . .	..	..	..	..	8,366	7,994	5,330
(3) with factories . . . . .	..	..	..	..	..	4,000	130,000
Production of sugar—							
(a) Direct from cane	119,859	153,581	290,177	453,965	578,115	932,100	1,123,900
(b) Refined from gur	29,700	61,990	77,995	64,890	43,500	47,876	24,813
(c) Khandasris	200,000	250,000	275,000	200,000	150,000	125,000	100,000
Imports of sugar by sea	697,621	443,200	324,400	245,300	200,100	93,800	16,000 (est)
Imports of sugar by sea into Kathiawar ports.†	114,758	93,000†	64,000†	87,094	113,400	45,200	12,500 (est)
Total supply	1,199,038	1,038,281	1,050,748	1,060,306	1,115,111	1,263,159	1,441,227
Re-export of sugar by sea	3,691	4,414	3,687	11,900	2,157	6,206	6,000 (est)
Export of sugar by sea	268	392	356	434	357	449	8,500 (est)
Export of sugar by land	36,876	32,000	31,957	30,607	29,939	27,667	30,000 (est)
Closing Stock—							
(1) in ports	37,600	19,176	9,057	21,630	11,189	23,684	24,000
(2) in principal inland markets . . . . .	..	..	..	..	7,994	5,330	12,000
(3) with factories . . . . .	..	..	..	..	4,000	130,000	160,000
Total to be deducted	73,435	55,972	44,957	64,571	51,636	193,336	240,500
Quantity consumed to the nearest thousand	1,121,000	982,000	1,006,000	996,000	1,059,000	1,074,000	1,201,000

* Narayanganj, Chittagong, Gauhati, Bhagalpur, Patna, Bareilly, Muttra, Ambala, Jullundar, Amritsar, Peshawar, Vizianagram, Rajamundry, Cochin, Calicut, Vizagapatnam, Cooranada.

† The figures for the year 1930-31 relate to "Imports of sugar into B. I. by land through Kathiawar" only.

‡ Figure relate to official year April to March.

157. Consumption in the triennium 1931-32 to 1933-34, a period of economic depression, fell below the 1930-31 figures to a level of about a million tons. In 1934-35

Consumption. and 1935-36 with the passing of the economic depression and an increase in the purchasing power of the population consumption increased. In 1936-37 it is generally agreed that the reduction in the price of sugar gave a considerable stimulus to consumption. From the figures it would appear that it increased to 1,201,000 tons but we are inclined to think on the evidence we have received as to the decline in the manufacture of sugar by 'open pan' and 'khandsari' processes that production is overestimated and that consequently the actual amount of consumption was somewhat below the estimate. As regards stocks, it will be seen that the quantity held by factories on November 1st was insignificant in 1935 but had increased to 130,000 tons in 1936 and to 160,000 tons in 1937. These figures, however, are not a correct indication of the actual 'carry over' of old stock to a new season because hardly any factories have begun the production of new sugar by November 1st and many factories do not start crushing till December. We have obtained returns of stocks as on November 15th from 123 factories and refineries out of 149. On the basis of the returns supplied we estimate the 'carry over' of stocks with factories to have been 100,000 tons from the 1936 season and 140,000 tons from the 1937 season.

Including stocks at ports and inland markets the total 'carry over' may be taken to have been 129,000 tons in 1936 and 176,000 tons in 1937. In comparison with stocks in other countries a total carry over of 181,000 tons may not seem alarmingly large, but in the peculiar circumstances of India where sugar deteriorates in storage it may be considered to be on the high side.

The next point for consideration is the question of overproduction. Leaving imports out of account, the internal production of sugar in India exceeded the estimated consumption by 31,000 tons in 1935-36 and by 53,000 tons in 1936-37. In 1937-38, allowing for the extension in capacity of existing factories and the opening of 9 new factories, it is possible that production may increase by 50,000 tons unless the reduction in the acreage of sugarcane in the United Provinces and Bihar results in the curtailment of the crushing season or other circumstances intervene. It is, in our opinion, unlikely that consumption can increase at the same rate as in 1936-37 and there is even a possibility that it may remain more or less stationary. As we have shown in an earlier Chapter, the consumption of sugar is to some extent dependent on its price relatively to the price of gur. Should the upward tendency in the price of sugar continue and no corresponding increase in the price of gur occur, it is not improbable that the class of consumers who regulate their purchases of gur and sugar according to the difference in price, may buy less sugar and more gur. No considerable addition to the normal consumption of sugar can be expected from the development of subsidiary industries in the near future, as we shall show in a later Chapter. Unless, therefore, the production of

sugar is in some way regulated, overproduction may give rise to further difficulties in the industry, even if imports of sugar remain at the present low level. We are told that some factories make a practice of crushing cane beyond their real capacity which does not improve the quality of the sugar produced. One method of regulating production, it is suggested, is to limit the crushing of all factories to their proper capacities. But by itself this may not be enough, and it may prove necessary to control the erection of new factories and the extension of existing factories by some system of licensing. Another method of contracting production is the fixation of quotas of production of factories. In our opinion the overproduction of sugar has already reached a point at which the limitation of production is an urgent necessity and should receive immediate consideration.

158. We shall next consider the territorial distribution of consumption. The following Table supplied by the Director of the

Technological Institute shows the estimated consumption in the principal consuming areas in 1935-36:—

TABLE I.—*Consumption of sugar by Provinces.*

(November to October.)

	1935-36.	<i>Per capita</i> in lbs.
	Tons.	
Bengal	158,000	6·7
Bombay	212,000	15·5
Madras	72,000	2·8
Bihar and Orissa	62,000	3·1
United Provinces	131,000	5·6
Punjab, North-West Frontier Province and Delhi	238,000	14·6
Central Provinces and Berar	40,000	5·1
Assam	14,000	3·5
Sind and British Baluchistan	22,000	9·5
Rajputana	53,000	9·5
Central India	28,000	6·1
Nizam's territory	18,000	2·6
Kashmir	2,000	1·2
Mysore	8,000	2·6
Burma	21,000	3·1
All-India	1,074,000	6·5

It will be observed that in the United Provinces, Bihar and Mysore State internal production exceeds consumption and sugar is exported. All other areas import sugar to a greater or less extent. In 1936-37 the exports from the United Provinces and Bihar taken together may be estimated to have been approximately $\frac{3}{4}$ million tons. It is, however, doubtful if this figure can be for long maintained. The present tendency is for importing areas to

increase their production, more especially Indian States, some of whom are in a position to protect their home market by import duties. It is significant that of the 9 new factories under construction or projected 5 are in Indian States. The loss of markets in importing areas must have an adverse effect on factories in exporting areas. There is, in fact, a conflict of interest between factories in the United Provinces and Bihar and factories in other provinces which has been brought to our notice in more than one connection. If owing to the fixation of minimum prices for cane at a higher level, the cost of manufacture in factories situated in the United Provinces and Bihar is increased, their ability to compete in external markets will proportionately diminish. We have ourselves observed a growing feeling on the part of importing provinces that dependence on other provinces for their supply of sugar should not be allowed to continue indefinitely. If special encouragement is given to the development of local enterprise in importing provinces, some readjustment of the territorial distribution of production is inevitable.

159. There remains to be considered the results of the policy of discriminating protection from the consumers' point of view.

The consumer. The increase in the import duty in 1931 had the immediate effect of raising the price of both imported and Indian sugar. The higher range of prices continued till 1933-34 when the price of Indian sugar ceased to depend on the price of the imported article and a sharp fall occurred. The imposition of the excise duty in April 1934 had the effect of raising the price though not to the full extent of the duty. In 1936 the price of Indian sugar again took a downward turn and by June 1937 had reached the level of Rs. 6-1-6 per maund. Since that date there has been some recovery, but the average price in November 1937 was no higher than Rs. 6-14-6. Thus the consumer is paying on an average Rs. 1-15-3 a maund less than he paid in 1930-31 for Indian sugar in spite of the fact that it bears an excise duty of Rs. 1-7-6 per maund.

The price of imported sugar has remained above the level of 1930-31 as was to be expected, but from the point of view of the ordinary consumer this is a matter of small importance, because Indian sugar is available in sufficient quantities. The ordinary consumer has, so far, no cause of complaint against the policy of protection and indeed every reason to be satisfied. Even if in consequence of a rise in the cost of manufacture due to an increase in the cost of raw material, the selling price of sugar is raised, it seems improbable that the consumer will have to pay more than he did before the advent of protection.

CHAPTER XI.

Exports.

160. Our attention has been drawn by the Indian Sugar Mills Association to the question of the export of sugar from India. At present sugar is exported (1) by sea to Burma and Ceylon, and (2) by land to Afghanistan, Central Asia, Turkistan, Tibet, Nepal, Sikkim and Bhutan.

Exports by sea.

161. In the following Table we give the figures for the exports of sugar by sea:—

TABLE LI.—*Export of Indian Sugar by Sea.*

	1934-35.	1935-36.	1936-37.
	Tons.	Tons.	Tons.
Ceylon	360	376	475
Burma	2,341	1,300	18,762
Other countries	3	13	44
	<u>2,704</u>	<u>1,689</u>	<u>19,281</u>

Burma is the only country to which Indian sugar is at present exported in any quantity. This market is, therefore, very important for India so far as her export trade in sugar is concerned in view of the recent International Agreement. In Burma there are at present three factories reported to be working with a total daily crushing capacity of about 1,800 tons, and an annual production of about 17,500 tons of sugar. As a result of competition from locally manufactured sugar, imports into Burma from India decreased from 2,341 tons in 1934-35 to 1,300 tons in 1935-36, a reduction of 45 per cent., whereas the imports from Java fell from 16,570 tons to 15,225 tons or a decrease of 9 per cent. during the same period. Imports from India begin generally from July and continue till the end of November. In 1936-37 imports of Indian sugar amounted to 19,000 tons and imports of Java sugar to 3,100 tons owing to the fall in the price of Indian sugar.

162. We have ascertained from the merchants the procedure adopted with regard to the export of sugar. Sugar is purchased from the selling agents: the exporter only gets the bills of lading from the mill and the goods are despatched direct from the mill siding to Rangoon *via* Howrah, and if they are purchased on condition of shipment by flats, *via* Jagannath Ghat. The merchants prefer the railway route up to Howrah on account of early delivery as despatch by the river route is very inconvenient and subject to delays. The shipment to Burma is effected in the case of railways through Messrs. Cox. and Kings, Limited, and in the case of flats through Messrs. Kilburn and Company. Over and above the price of sugar including railway freight, the exporter has to pay 5 annas per maund

to the selling agents for various charges. On arrival of the goods at Rangoon he has to pay Rs. 2 a cwt. as excise duty and a fee of one rupee to obtain the Customs certificate showing that the goods have paid the duty in Burma. The certificate is then given to the exporter who has to obtain the refund of the excise duty from the mill, which sometimes takes as much as 4 months, with the result that a large amount of his money is locked up. Most of the Rangoon merchants buy sugar on the explicit condition that exporters deduct the Burma excise duty from the sale bills. Some of the mills grant a rebate of 2 annas for foreign shipment to their buyers for Rangoon, but it goes to the selling agents. If the shipment is effected by the shippers themselves, who have got their own offices in Calcutta, the charges per maund come to about 3 annas for freight, 6 pies for boating and handling and 9 pies for port Commissioners' charges which leaves a margin of 9 pies to the shipping agents.

We have been informed that unless the difficulty of the merchants with regard to excise and other matters are remedied, the exports to Burma are likely to decrease in future. At present we are informed that the exporters cannot get a refund of the excise duty unless they consign sugar through Messrs. Cox and Kings, Limited, or Messrs. Kilburn and Company. In this connection we have received a copy of letter from the Secretary, Central Board of Revenue, to the Indian Sugar Mills Association stating that better arrangements are being made with regard to the refund of the excise duty in future.

163. The additional difficulties mentioned by the merchants as hampering the development of the export trade to Burma include the following:—

- (1) On the arrival of the goods at Howrah Station the shipping agents take delivery and ship them by steamers; exporters are given no opportunity of examining the goods and they do not know the condition of the sugar before its despatch. The exporters cannot claim damages, which might have occurred during transit either from the railway authorities or from the steamer company.
- (2) Nor do the exporters know when and by what steamer sugar is shipped. This lack of information makes marketing difficult.
- (3) Further, they have to pay 3 annas per bag to shipping agents although shippers have their own offices in Calcutta.

These difficulties of the merchants appear to us real and we hope that efforts will be made to remedy them.

164. We now propose to examine the question of the probable future development of the trade. Under the present arrangements Burma levies the same amount of duty on foreign sugar (other than Indian) as is in force in India on her imports. This

Future developments
of trade.

arrangement is due to expire in 1942 and we do not know what the position will then be. Burma is already producing about half of her requirements and there is likelihood of her production being increased in future. If the same rate of duty is imposed on Indian and Java sugar there is a danger of Indian sugar being replaced by Java sugar since the cost of production in Java is much lower. India therefore cannot place much reliance on the Burmese market for her exports after 1942.

165. In Ceylon the same rate of duty of Rs. 7-8-0 per cwt. is levied both on Indian and foreign sugar and Indian sugar is

Export to Ceylon. unable to compete with cheaper sugar imported from other countries. Under the Ottawa Agreement India enjoys certain preferences, specially for food grains, in the Ceylon market, while Ceylon in return enjoys preferences in certain commodities in the Indian market. But the question of including Indian sugar in the list of preferences did not arise, as at the time of the Ottawa Agreement India herself was importing sugar and had no surplus for export.

The position has changed since the Ottawa Agreement. India is in need of markets for sugar and from her geographical position Ceylon appears to be a natural market. The question, however, is not of immediate importance because under the International Sugar Agreement of 1937 India is prohibited from exporting sugar to Ceylon.

166. We now propose to discuss the question of export to the United Kingdom which constitutes to-day one of the large 'free Export to United Kingdom. markets' for sugar in the world. The annual consumption of sugar in the United Kingdom for the past three years expressed

in terms of raw sugar has been as under:—

Year.	Tons.
1934	2,200,435
1935	2,216,415
1936	2,323,345

The Indian Sugar Mills Association have supplied us a cost statement showing the possibilities of exports provided India is given a Colonial Certificated rate of duty. We give below Tables of exports to the United Kingdom both according to the polarisation and according to the countries from which sugar is imported:—

TABLE LII.—*Imports into the United Kingdom—Sugar—unrefined—Cane and other sorts.*

Polarization.	1934. Cwts.	1935. Cwts.
Exceeding—		
95° but not exceeding 96° . .	4,790,518	2,453,604
96° but not exceeding 97° . .	13,531,836	15,251,052
97° but not exceeding 98° . .	5,982,863	8,373,793
98°	11,689,499	10,757,092

TABLE LIII.—Imports of Sugar into United Kingdom.

Countries whence consigned.	1934.		1935.		1936.		1937.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwts.	£	Cwts.	£	Cwts.	£	Cwts.	£
<i>Sugar, refined</i> [(i) In lumps and leaves and (ii) Other sorts, including sugarcandy].	22	16	3	2				
Total from British countries	50	20	23	9				
Germany	257	106	133	63				
Netherlands	112	49	278	102				
Belgium	27	11	..	..		
France	246	99	297	110				
Czechoslovakia	290	109	273	101				
United States of America	15	4	25	8				
Other foreign countries	997	398	1,029	383				
Total from foreign countries	1,019	414	1,032	386	653	250	441	179
TOTAL								
<i>Sugar, unrefined</i> [(i) Beetroot and (ii) Cane and other sorts].	1,581	645	3,101	1,290	2,080	1,107	634	303
Union of South Africa	151	81	74	37				
Kenya	130	68	162	78				
Uganda Protectorate	4,345	2,170	3,702	1,672				
Mauritius and Dependencies	6,885	2,817	4,802	1,944				
Australia	1,327	582	1,349	628	5,070	2,322	3,762	1,964
Fiji	2,794	1,343	1,761	849	6,320	2,609	3,342	1,502
British West India Islands	1,713	813	1,109	517	1,857	793	590	264
British Guiana	3	1	..	..	3,553	1,638	3,998	1,968
Other British countries					1,423	630	1,349	642
Total British Countries	18,809	8,520	16,050	6,924	285	145	140	73
					21,206	9,304	13,816	6,710

Not separately shown.

Not shown separately.

TABLE LIII.—Imports of Sugar into the United Kingdom—contd.

Countries whence consigned.	1934.		1935.		1936.		1937.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
<i>Sugar, unrefined [(i) Beedfoot and (ii) Cane and other sorts]</i> <i>—contd.</i>	Cwts.	£	Cwts.	£	Cwts.	£	Cwts.	£
Denmark	284	70	..	..	..	..	..	..
Poland	452	112	325	77	447	116	178	54
Germany . . . . .	..	..	5	1	..	..	..	..
Netherlands	61	20	19	6	..	..	..	..
Java	393	100	329	79	..	..	..	..
Dutch Guiana	68	18	24	7	..	..	..	..
Czechoslovakia	1	1	6	2	..	..	..	..
United States of America	329	131	248	91	326	118	173	70
Cuba	10,800	2,595	11,005	2,502	14,082	3,354	4,010	1,238
Hayti	414	101	579	137	..	..	..	..
St. Domingo	3,052	751	6,179	1,466	4,248	1,007	1,942	612
Venezuela	65	17	1	1	..	..	..	..
Peru	2,921	702	2,901	685	2,700	651	981	283
Brazil	482	121	608	158	1,048	261	..	..
Other Foreign Countries	84	17	31	10	523	130	507	160
Total Foreign Countries	19,386	4,756	22,283	5,312	23,350	5,637	7,777	2,417
TOTAL	38,255	13,276	38,303	12,236	44,565	14,041	21,592	9,133

The United Kingdom imports two classes of sugar, one exceeding 98° polarization from countries like Mauritius, Australia, etc., and the other raw sugar not exceeding 96° polarization from countries like Cuba and the West Indies. The bulk of the imports are, however, of the latter class for refining purposes. We give below a Table showing the rates of duties in force in the United Kingdom on sugar:—

TABLE LIV.—*United Kingdom Customs Duties on Sugar.*

Class or description of goods.	Rates of duty.					
	Full. (F)		Preferential Empire. (P)		Preferential Certificated Colonial (C)	
	The Cwt.		The Cwt.		The Cwt.	
	s.	d.	s.	d.	s.	d.
Sugar and C. Sugar—Of a polarization—						
Exceeding—						
99°	11	8	5 10·0		2	4·7
98° but not exceeding 99°	11	8	4 9·2		1	6·3
97° but not exceeding 98°	8	7·0	4 7·7		1	5·8
96° but not exceeding 97°	8	4·8	4 6·8		1	5·3
95° but not exceeding 96°	8	1·6	4 4·8		1	4·8

(F) rates: These rates of duty are applicable to all imported sugars, etc., not entitled to preference.

(P) rates: These rates of duty are applicable to Empire sugars, etc., which, although fulfilling the conditions for Preference, are not entitled to (C) ratings.

(C) rates: These rates are applicable to sugars, which in addition to fulfilling the ordinary Preference conditions, are produced in and consigned from any of the Colonies, Protectorates or mandated Territories to which section 2 of the Finance Act, 1932, applies and are covered by a Colonial Sugar Certificate.

It will be seen that the duties vary according to the polarisation and also according to the country from which sugar is imported. Empire grown sugar is given a preference in the United Kingdom market over 'foreign sugar'. Thus, whereas the duty on foreign sugar of 96° polarisation (raw sugar) in the United Kingdom is 8s. 4·3d. per cwt., 'Empire' sugar has to pay only about half this rate, *viz.*, 4s. 6·3d. per cwt. Even within the Empire, however, certain countries are given a further preference in order to help the Colonial sugar planting interests and sugar coming from these countries is admitted at 1s. 5·3d. per cwt. This 'preference within preference' is, for example, enjoyed by Mauritius. The Indian Sugar Mills Association state that as India is now in a position to export sugar, special preference should be given to Indian sugar in the United Kingdom market and a specified quota allotted to it.

167. Indian sugar, if exported to United Kingdom, will at present have to pay the same import duty as 'Empire' sugar

under the Ottawa Agreement but considering the intimate economic relationship between the two countries, the Association urge that Indian sugar should be given a special preference and an arrangement made so as to enable a fixed quantity to be imported yearly into United Kingdom if not free of import duty at least on payment of the duty at the Certificated Colonial rate. But before we can support this claim it is necessary for us to ascertain whether India is in a position to manufacture sugar not exceeding 96° at a reasonable cost. We find that at present mills in India are not producing raw sugar of 96° polarisation because there is no demand for such sugar in the internal market. But the Indian Sugar Mills Association as well as those who are conversant with the industry are definitely of opinion that not only India can manufacture this class of sugar but that the cost of manufacture would be lower than for the first grade quality of Indian sugar. We are further informed that no extra capital expenditure is necessary and the existing plants would serve to produce this class of sugar. The Director of the Sugar Technological Institute has submitted a note regarding the cost of manufacturing raw sugar in India in which he has pointed out the various economies which become possible when raw sugar is manufactured as compared with ordinary sugar. Some of these economies are described below:—

- (i) As a result of the lower polarisation of raw sugar its yield per 100 maunds of cane is proportionately higher, the factory efficiency remaining the same as when white sugar is produced. Thus for a factory producing $9\frac{1}{2}$ per cent. white sugar, the yield of 95° polarisation raw sugar will be 10 per cent. and in consequence there will be a proportionate reduction in the manufacturing expenses.
- (ii) Apart from this reduction in manufacturing expenses due to the higher yield of raw sugar, various other economies will be possible as a result of the simpler process followed for producing such sugar. Thus, for clarification of juice no sulphur is used and the quantity of lime is much smaller.
- (iii) Fuel consumption in raw sugar factories is much lower due to economy of steam in pan boiling (where the two-massecuite process is adopted instead of the three or four massecuite process of white sugar manufacture) and in drying of sugar in centrifugal machines and dryers. Again, as cheaper bags are used for raw sugar cost of packing is proportionately reduced. Finally, the process for raw sugar manufacture is simpler, less skilled labour is necessary and expenditure under salaries and wages will be lower.
- (iv) The capital cost of new factories for making raw sugar will be much lower than that of factories of the same

size for producing white sugar. Existing white sugar factories, if converted for making raw sugar, will have a larger output and the effect of this increased production will be a reduction in salaries and wages, and overheads.

It is not possible to make an exact calculation of the saving due to these economies but we are informed that it will result in a reduction of about 6 annas per maund of sugar. The manufacturing expenses (including depreciation and overhead charges) per maund of raw sugar will therefore be lower to that extent. The yield of molasses will be higher and of better quality.

The next item we have to consider is the cost of Raw Material. Since the introduction of protection the area under cane has considerably increased but the manufacturers of sugar can crush only about 22 per cent. of the total quantity of cane grown. We have already emphasised the agricultural importance of sugarcane. Unless factories increase their purchases it is possible that the area may shrink in future and a serious position may arise, especially in the United Provinces and Bihar where sugarcane is the only cash crop. In fact, this year the cane cultivation has decreased by 9 per cent. according to the forecast of 1937-38 owing to the fall in the price of gur. It is possible that the consumption of sugarcane may increase in future by the introduction of subsidiary industries such as fruit canning, confectionery, sweets, preserves, etc., but we cannot anticipate any substantial increase on this account. It is, therefore, necessary in the interest of the cultivator to see whether any additional demand for his cane can be created.

We have assumed 5 annas 6 pies per maund as the price of cane delivered at factory for the whole of India. At this rate it will not be possible to manufacture sugar (raw) at a price which will enable India to export sugar under the Empire rate of duty. We have examined the cost of cane in different areas and we find that at least one factory which grows its own cane is able to obtain it at 4 annas 3 pies per maund delivered at the factory. This factory also possesses an additional advantage of sugar recovery of 11·43 per cent.

On the basis of these figures the cost of production of raw sugar in this factory may be estimated as follows:—

TABLE LV.

	Per maund of sugar. Rs. A. P.		
1. Cost of 8·3 maunds of cane (corresponding to a yield of 12 per cent. sugar on cane) at 4 annas 3 pies per maund delivered at factory	2	3	3
2. Manufacturing expenses including depreciation and overhead charges	1	4	0

TABLE LV—*contd.*

	Per maund of sugar. Rs. A. P.
3. <i>Add</i> profit at 10 per cent. on capital (assuming Rs. 15,00,000 as capital cost of a factory crushing about 32,00,000 maunds per season and producing 12 per cent. raw sugar . . .	0 6 3
Total cost of production of raw sugar . . .	3 13 6
<i>Deduct</i> value of 3½ per cent. molasses at 4 annas per maund	0 1 6
	<hr/> 3 12 0 <hr/>

or Rs. 5-1-8·4 per cwt. or 7s. 8d. per cwt.

We shall next examine the question of (1) the railway freight and (2) the ocean freight. We have ascertained the freight from this factory to Bombay and we find that it works out on an average to about 12 annas 3 pies or 1s. 1d. per cwt. The present rates, however, are fixed in consideration of internal movement of sugar only and have no relation to exports. It is probable that for consignments of sugar meant for export outside the country, the railways may quote specially reduced rates, as they are doing for the export of wheat from Karachi and of petrol from the North-West Frontier to Afghanistan. With regard to the ocean freight the question has not been considered because there is no export trade in sugar from India. It is presumed, however, that with the chances of an appreciable export trade developing, the steamer companies could be prevailed upon to offer specially low rates. The Indian Sugar Mills Association have supplied us the present freight rates from Indian ports to the United Kingdom inclusive of all charges amounting to Rs. 1-5-4 or 1s. 11d. per cwt. The c.i.f. price for Indian sugar will be as follows:—

TABLE LVI.

	Per cwt. of sugar. s. d.
Fair selling price of sugar	7 8
Railway freight from factory to port	1 1
Ocean freight from Calcutta to United Kingdom port including dock charges	1 11
C.i.f. price	<hr/> 10 8 <hr/>

The present quotations of the sellers price of each of the three classes of raw sugar, *viz.*, Foreign, Empire and Colonial, imported into the United Kingdom are as follows:—

TABLE LVII.

	C.i.f. Sellers rates per cwt. s. d.
Foreign	6 8
Empire	10 5
Colonial (Mauritius)	11 1

It will be seen that the price for Indian sugar (raw) is 3*d.* per cwt. above the current price of Empire preferential sugar and 5*d.* per cwt. lower than that of Colonial certificated sugar.

These calculations have been made in order to ascertain the possibilities of export. In the ordinary course we would have estimated the fair selling price of raw sugar for the whole of India but we do not think any useful purpose would be served by considering the question from this point of view. But if our recommendations in regard to research are carried out and proper financial assistance given, the cost of cultivation itself may be reduced by an increase in the yield and the sucrose content.

The question is at present only of academic interest in view of the decision of the Government of India to ratify the International Sugar Agreement which prohibits India from exporting sugar to the United Kingdom. When the restriction is removed, we recommend that the matter be fully investigated and if it is found that the industry cannot manufacture raw sugar at a reasonable profit, some sort of subsidy out of the receipts from the sugar excise duty may be given to encourage the production of raw sugar.

168. We shall next examine the question of the markets beyond the land frontiers of India. We give below a Table showing the figures for the years 1934-35 to 1936-37 compiled from the publication "Trade at Stations adjacent to land frontier routes" :—

Export across land
frontiers.

TABLE LVIII.—*Export of refined sugar by land.*

	Tons.
1934-35	33,706
1935-36	25,498
1936-37	30,350

The figures make no distinction between Indian and foreign sugar, but we understand that no Indian sugar is at present exported to the markets like Afghanistan, Kashmir and Nepal where a large quantity of Java sugar is consumed. Some attempts have been made in the past to explore these markets, but the reason of the failure was partly the deficiency in the quality of Indian sugar and partly the high cost of manufacture as compared with Java sugar. Java and other foreign sugars get a full refund of the import duty levied in India when the goods are re-exported. This is a very serious handicap and unless a preferential rate of duty can be negotiated for Indian sugar, we see no prospect of the import trade developing to any considerable extent.

CHAPTER XII.

Research.

169. In previous Chapters we have dealt with the agricultural side of the industry and have noted the progress made in the yield per acre, the sucrose content of cane and sugar recovery. As compared with other sugar producing countries, however, we find that in India there is still very great room for improvement.

The previous Tariff Board laid very great emphasis on the need for development and research and pointed out that without them the whole purpose of the scheme of protection was likely to be delayed if not defeated. Indeed they regarded research almost a condition precedent to protection.

The Board pointed to the wide scope of research work in institutes in Java and Hawaii by way of contrast to the very little attempted in India and in particular recommended that no financial considerations should be allowed to retard research work at Coimbatore in connection with thick canes suitable for the tropical area and, secondly, that Coimbatore varieties should be tried out in various soils in different provinces. At the same time, the Board directed attention to other problems such as the improvement of the keeping quality of gur (jaggery), the manufacture of gur of approved quality in central factories and the improvements of the types of mill driven by small oil engines and the provision of facilities for technical training for Indians both in India and abroad.

170. We now propose to discuss the progress already made in sugarcane research since 1931 as indicated by a note submitted by

General progress. the Imperial Council of Agricultural Research (prepared by their Agricultural Expert, Dr. W. Burns) and evidence from other sources including provincial Governments. It is not, however, necessary for us to go into detail, because the subject has been fully dealt with by Sir John Russell in his recent report on the work of the Imperial Council of Agricultural Research in applying science to crop production in India. We find ourselves in general agreement with his conclusions and we, therefore, attempt only a brief survey of the position as it strikes us with a view to emphasizing some features to which we attach importance from the point of view of sugar protection.

The Imperial Council of Agricultural Research from its inception devoted special attention to sugarcane and has succeeded in stimulating work embracing such varied aspects as botanical, chemical, agricultural, entomological, mycological and technological. The sugarcane breeding station at Coimbatore is still the parent institution, but it has been provided with a branch in

Karnal (Punjab). In addition, Jorhat (Assam), Dacca (Bengal), Pusa (Bihar), Shahjahanpur (United Provinces), Muzaffarnagar (United Provinces), Jullundur (Punjab), Lyallpur (Punjab), Padegaon (Bombay), Anakapalle (Madras) and Gudiyattam (Madras) constitute a regular chain of provincial stations for research and testing of Coimbatore seedlings. A new station is to be opened in the Peshawar valley. Similar work is being done at the Hebbal Farm in Mysore State.

171. We understand from Rao Bahadur Venkataraman, Government Sugarcane Expert, Coimbatore, that investigations in his Institute have been based on as wide a range of parents as possible for hybridisation. India is rich in various kinds of wild sugarcane (*Saccharum spontaneus*) and the indigenous material has been supplemented from foreign countries like Java, Sumatra and Central Turkestan.

In 1930 an important crossing of cane was made with sorghum (jawar) and in 1936 another remarkable cross was achieved between sugarcane and bamboo. The economic results of these experiments have still to be studied but research in itself is undoubtedly of great scientific value and may ultimately change the whole character of sugarcane breeding.

With regard to the work on the breeding of thick canes it was started only in 1926. Of the first batch of thick canes issued in 1931, Co.360 at Padegaon Research Station yielded as much as the famous Java cane POJ.2878 but it was in the third batch of 1933 that the most notable advance was made with Co.419 whose performance in respect of yield has been remarkable at Anakapalle, Samalkot and Palur in Madras, at Padegaon in Bombay, in Assam and in Burma. In the sub-tropical area (e.g., Punjab and Bihar) Co.421 seems to be more promising.

172. While indigenous canes have been now mostly replaced by improved types the new varieties themselves are being improved upon as a result of continuous experiments and research. Continuous trials of new varieties are essential if the present yields are to be maintained and bettered. Experience in sugarcane cultivation shows that the same varieties if grown year after year deteriorate in yield or become susceptible to pests and diseases. At the same time, as we have noted in an earlier chapter, performances of the same cane in yield and quality in one part of India are very different from what they are in another.

173. We next turn to the important subject of diseases and insect pests. The principal diseases of the sugarcane are mosaic, red rot, wilt, smut and top rot. Of these at one time the most prevalent in India was mosaic, so called because of the mottled or striped appearance of the sugarcane leaves attacked, but the disease is no longer considered serious in Northern India.

In the United Provinces the major diseases are red rot, stinking rot, smut and mosaic. Investigations have been made by the Plant Pathologist to Government working at Cawnpore who has collaborated with the Imperial Mycologist in studying the effect of mosaic on sugarcane.

According to the Director of Agriculture, United Provinces, 'rogueing' and seed cane selection have been found to reduce mosaic infection to 0.1 per cent. in three years. Red rot which occasionally develops into a serious outbreak and stinking rot which occurs only during the rains, are also controlled by a careful selection of the sets. Smut seldom appears in an epidemic form. In Bihar top rot is on the increase. Red rot is rare but smut exists in Shahabad, Patna and North Champaran. The loss from top rot in cane and the sugar yield from cane is found to be about 11.3 per cent. and 9.6 per cent. respectively.

In Madras there is little sugarcane disease. Experiments on the relative resistance of different varieties were continued at Madras and in 1933-34 and 1934-35 a programme of inbreeding was carried out with Co.214 since this variety yields seedlings immune to mosaic.

174. The main insect pests are the top-shoot-borer (*Seirpophaga nivella*), the stem borer (*Argyria stictioraspis* and *Diatraea venosata*) and the root borer (*Emalooera depressella*) pyrilla and white ants.

In the United Provinces insect pests in western districts are more serious than in other parts and their attacks are spread over several months, stem borer before the monsoon, top borer after the monsoon, root borer in August and Pyrilla and white fly from July to October.

According to the Director of Agriculture, the borer trouble in Bihar is almost universal and is more acute in alternate years, ratoons being most affected of all. The damage caused by top borer is considerably more than by either a stem or root borer. There is also the white ant trouble in parts of Chota Nagpur, Arrah and the whole of North Bihar.

At Dacca all canes suffered heavily from an attack of stem borer in March, 1936, followed by top borer in May. The red laterite soil of the Dacca farm seems to favour insect pests, as the damage was 50 to 60 per cent. as against almost nothing in the neighbouring districts of Tipperah and Mymensingh.

The extent of the damage caused by insects can be judged from the results of a recent survey made by Dr. J. H. Haldane, Chief Chemist of Messrs. Begg Sutherland and Company, Limited (published in "Agriculture and Livestock in India", September, 1937). The survey covered ten factories, five in Bihar and the other five in Eastern United Provinces.

The results obtained point to a progressive and alarming increment in the degree of infestation.

Per cent. degree of infestation.

	Marhowrah.	Samastipur.	Ryam.	Barrah.	Chanpatia.
1935 . . .	26	11.05	19.5	30.2	18.8
1937 . . .	40	34.8	50.0	34.6	48.7

	Purtabpore.	Tamkohl.	Gauri.	Balrampur.	Tulsipur.
1935 . . .	15.3	Not known.	12.5	14.0	Not known.
1937 . . .	31.1	45.7	17.3	24.3	26.3

The total loss of commercial sugar in these ten factories during February, 1937, was 59,359 maunds which at the rate of Rs. 6 per maund amounts to Rs. 3,56,000. On a season of 5 months the loss would amount to Rs. 17,80,000. If this source of loss were eliminated, the efficiency of factories would be improved further and their cost of production could be reduced. The supply of sound cane to all factories according to a note of the Imperial Council of Agricultural Research would result in an increase of approximately 1 per cent. in the yield of sugar and a considerable reduction in production of waste molasses. At the same time, improved quality of cane would help in the production of a more uniform and a better quality of sugar.

Several treatments to exterminate the pests are being tried, but they are nothing compared to the amount of work required. At Muzaffarnagar use of superphosphates and sulphate of potash with niciphos has tended to reduce the top borer attack, while at Jorhat in Assam light traps were laid and 2,859 moths were caught in 1935-36. In Mysore considerable success has been achieved with the parasite *Trichogramma minutum* which is bred in large numbers in the laboratory and liberated in the cane fields. White ants have been successfully controlled at Palur (Madras) by the application of tar emulsion with irrigation water.

Sugarcane diseases and pests are the subject of research at the Imperial Agricultural Research Institute at New Delhi. The work was begun in 1932 with an annual grant of Rs. 18,596 and a non-recurring grant of Rs. 12,000. The work is at present admittedly in its infancy and for want of funds very little has been attempted in the provinces. The Director of Agriculture, Bihar, frankly admits that the Department of Agriculture has so far done nothing on the control of pests and diseases and has no detailed information on the present position. According to him "a very strong and adequate staff and funds are essential if the Department is to render the service which the industry rightly expects and demands. Repeated requests for these have not met with any response from the provincial Government on financial grounds. A modest request from the Government of India Sugar Excise Fund has been only partly sanctioned and the Department therefore cannot be held responsible if it is unable to render the service expected of it".

We would like to endorse the following observations of Sir John Russell:—

“The increase in area under sugarcane is almost certain to be accompanied by an increase in insect and fungus attack and an accumulation of the pests, and the problems concerned are more serious than those of cultivation and manuring, because they are less definite and more spasmodic in their incidence. In particular more information is wanted as to the extent to which ratooning which has obvious economic advantages, is sufficiently favourable to the carrying over of pests and diseases to cause serious difficulties later on. Also it is important to ascertain the effects on subsequent pests and disease attack, of destroying the tops, leaves and trash immediately the crop is harvested; or, of making them into compost, or simply leaving them to be disposed of at some later date. The information should be collected by means of surveys, the results of which should be worked up at the Imperial Research Institute.”

175. Having dealt with some of the main aspects of research, we proceed to examine how practical use can be made of the results obtained. In our opinion sugarcane research Testing of cane. with regard to yields is on right lines and has made good progress at Coimbatore, but the method of translating the results to the ryot's fields is far from satisfactory.

Improved varieties of cane are evolved at the Coimbatore Station but as soon as particular canes are considered promising, they are made over to the provincial departments of agriculture and the responsibility of the Coimbatore Station ceases. The Agricultural Departments have the new canes tested in provincial testing stations and when they are satisfied, the canes are then tried in small plots belonging to cultivators selected by the departments. On the results of the last examination approved canes are released for general cultivation.

The system appears to have several defects. In the first place. real experimental testing of the new Coimbatore varieties is limited to about a dozen testing stations and the present method of testing takes a long time. As Sir John Russell points out, at present “the work is confined too much to the laboratory and the pot culture house; the field and the growing crops should be the centre. Almost always it is restricted to the experimental stations: test experiments should be carried out on other soils and at other centres not too far removed so as to ensure that all factors coming into play are recognised”. Speaking of sugarcane in particular, Sir John Russell says “at an early stage a much simplified form of experiments should be tried on cultivator's land. Conclusions drawn from an experiment at a Research Station are greatly strengthened if they are confirmed on other farms also and, if they are not, this shows the existence of some other factor playing an important part and needing investigation”.

We are told that some factories which have farm of their own are willing and anxious to help in the work of testing canes if sent to them direct from Coimbatore on the understanding that such canes will not be released for general cultivation without the approval of the Agricultural Department concerned. It seems to us that more use could be made of the assistance of factory farms and that it would be advantageous to do so, because factories are in a position to test the milling quality of the canes which have been tried in their farms.

176. We are informed that in Java the system is quite different. When in the opinion of the Experiment Station any new cane is

considered promising and even before it takes a final decision about that cane, it is distributed for experimental growing and testing to the plantations scattered all over the Island. Of course, these test plots have to be laid out in the proper manner and it is obligatory on the part of these plantations to submit the results to the Experiment Station under definite heads and such data include rough descriptions of the soil and details of field operations done in the plots. The standard printed form in which the results are sent to the Experiment station even lays down the period between which the harvesting of the plots has to be commenced and completed.

These data sheets are studied, results tabulated and a decision taken as to which canes have proved winners. In taking a decision about the superiority of POJ.2878 in 1926-27, for instance, the Experiment station had results before it from as many as 257 trials. By this scheme not only is the decision more reliable on account of the large number of tests but a certain quantity of material of the selected cane becomes immediately available in almost every factory plantation for further multiplication. It may also be mentioned that the performance of the new canes on his own land and under his own condition is a very efficient and effective demonstration to the grower.

The rapidity of the spread of an improved variety in Java is evidenced from the fact that the superiority of POJ.2878 was first noticed in 1926 when it was growing in 200 test plots in the plantations. The cane proving promising in these plots, the number quadrupled to 800 in 1927. The cane spread to 12½ per cent. of the total sugarcane area in 1927, to 66 per cent. in 1928 and to 93 per cent. in 1929.

It is difficult to follow in India the Java scheme in its entirety, because conditions are different in the two countries. All cane in Java is grown by the factory and the experiment station is financed by the industry which ensures a close relationship between research and practice. In our opinion the two most urgent needs are an increase in the number of testing stations in the provinces and an improved system of trial in experimental plots both in cultivators' fields and in factory farms.

State Aid to Research.

Amounts spent on 177. The amounts spent from the Central sugar research. Revenues on sugar research are as follows:—

1934-35	.	.	.	.	.	.	Rs. 4,81,802 (actual).
1935-36	.	.	.	.	.	.	„ 5,63,862 „
1936-37	.	.	.	.	.	.	„ 5,96,800 (estimate).

These amounts are in addition to a sum of Rs. 18,50,000 made available to provincial Governments from the Sugar Excise Fund during these three years.

178. We have already referred to a number of directions in which research work is defective and have dealt at some length with the subject of sugarcane diseases and Schemes of Research. insect pests and the machinery necessary for expediting the translation of research into practice. The damage caused by diseases and insect pests in the principal sugar producing areas is so considerable that research work specially on insect pests should not be allowed to suffer for lack of funds. We have also stressed the need for increasing experiment stations with a large number of testing plots in factory farms and the cultivators' field. Even the best research will avail nothing unless its fruits are transferred to the ordinary cultivator.

179. We understand that the present research station at Coimbatore was last expanded in 1926. The Government Sugarcane Expert, Coimbatore, has indicated the need for expansion of the area devoted to the breeding of thick classes of cane. Other activities at the station such as the cyto-genetic work all need a larger area. Extra land required is estimated to be about 15 acres costing approximately Rs. 40,000 including the first lay out.

Physiological studies constitute another direction in which expansion is likely to be useful at Coimbatore. The Government Sugarcane Expert thinks that it would be a distinct advantage to have at the Station an officer acquainted with the latest methods in plant physiology. Among the subjects that could be usefully studied in this line are (1) Root absorption in the sugarcane—the nature and factors affecting the intake of solutes, (2) Growth processes in the cane, (3) Preservation of pollen beyond the period already secured to cross-pollinate varieties flowering at widely different times, (4) Influencing time of flowering and fertility of flowers for hybridisation, (5) Formation of fibre and pith and (6) Physiology of drought and frost resistance. All these have a direct bearing on cane breeding work and the best location for such investigation is Coimbatore.

Special attention should, in our opinion, be also given by the Coimbatore Research Station to the quality of cane as judged by sucrose content and in relation to the quantity of fibre before the cane is sent to the Provincial Stations. For the improvement of quality in addition to the improvement in yield close co-operation between the Coimbatore Station and the Agricultural Stations and factories seems to us essential.

180. In the United Provinces more funds are particularly required for (1) establishment of a research station for eastern cane area: (2) critical examination of the effects of ratooning: (3) detailed mycological investigation: (4) experiments on the correlation of cane development with soil and climate in different areas: (5) extension of physiological investigation for the Rohilkhand and eastern tracts: and (6) an additional entomologist.

The Agricultural Department of Bihar suggests that the present grant be doubled to enable it to open more testing stations. Funds are also required for the increase of staff.

Additional funds are needed for similar purposes in other provinces, specially Bombay, Madras and Bengal in which the sugar industry is developing.

In regard to the manufacture of gur we have made recommendations in an earlier Chapter.

Another matter to which our attention has been directed is the manufacture of gur and the production of sugar from the juice of the palmyra, date and other palms. No research work appears yet to have been done with a view to developing this branch of the industry.

181. Both Provincial Governments and the Sugar Industry regard the present funds for sugarcane research as inadequate and are unanimous in demanding much larger grants.

We understand that recently the Central Government has promised an annual grant of five lakhs beginning from 1938-39, subject of course to the vote of the Legislative Assembly. This is in addition to the amount provided for the Imperial Institute of Sugar Technology at Cawnpore which amounts roughly to Rs. 2½ lakhs per annum.

The grant from the excise duty at one anna per cwt. is estimated to yield Rs. 15 lakhs in 1937-38. In 1935 the Sugar Committee of the Imperial Council of Agricultural Research recommended to the Government of India that an amount equal to 2 annas per cwt. of the excise duty should be set apart for research. When the excise duty was raised by 50 per cent. in February, 1937, the suggestion was made that Government should set apart 3 annas per cwt. This proposal was supported by the Conference convened by the United Provinces Government at Naini Tal in June, 1937.

We are convinced that the only hope of the industry ever being able to compete on equal terms with other countries is a reduction in the cost of raw material. We would strongly recommend that the allotment from the excise fund should be raised from 1 anna to 3 annas per cwt. In consideration of the increased grant the Sugar Industry can reasonably be expected to supplement the amount by a special cess.

182. Another subject to which we attach special importance is technological research. In accordance with the recommendation of

the previous Tariff Board facilities for research and training in Technological Research. Sugar Technology were until 1936 provided in the Harcourt Butler Technological Institute, Cawnpore, which had an experimental sugar plant and a Sugar Technologist with a small staff. In October, 1936, the Government of India converted the sugar section of the Harcourt Butler Institute into a Central Institute of Sugar Technology with the present Sugar Technologist as Director and a staff on Sugar Technology, Sugar Engineering and Sugar Chemistry.

The duties of the sugar technologist are to advise sugar factory owners on difficulties that have arisen in the course of their work, to advise promoters of new sugar factories in regard to the selection of the site, the lay-out, machinery, etc., and to carry out experimental work with the object of improving factory practice.

The Institute has the following programme of experiments and research work to be carried out in the experimental factory:—

1. Experimenting on the treatment of factory effluents.
2. Experiments on cane dryage.
3. Different methods of sweetening of filter presses.
4. Milling experiments.
5. Experiments on rapid and slow cooling in crystallisers.
6. Experiments on different methods of graining in boiling pans.
7. Experiments on efficiency of different types of condensers.
8. Experiments on keeping quality of sugars.
9. Experiments on optimum p^H of juice for settling, etc.
10. Experiments with different dyes for blueing sugars.
11. Working out glucose/sucrose ratio in different juices and waste molasses.
12. Experiments with dry liming and the use of milk of lime clarification.
13. Experiments on boiler efficiency.
14. Comparison of different methods of factory control.
15. Clarification of syrup and molasses for reboiling.

On the instructional side the Institute provides courses for Associateship and Fellowship in Sugar Technology and Sugar Engineering, Sugar Boilers certificate and short courses in Chemical Control, Bacteriology, Statistics and the Dutch Language. The first session began on 10th July, 1937, with 26 new admissions besides 29 students taken over from the sugar section of the Harcourt Butler Technological Institute.

As regards technical advice and assistance to factories, small factories have sought and received it, but they complain that the charges are high. In the case of groups of factories, however, there is a feeling that the Institute at present is not in a position to give them the kind of assistance they require, because they feel

that the technical staff they employ is equally well qualified. We understand from the Indian Sugar Mills Association that what is required to make the Institute more serviceable to the industry is a highly qualified staff of a few experts with adequate practical experience of working in sugar mills—men of the calibre of Mr. Noel Deer, the well-known sugar expert. We feel that in order that the Institute may command the confidence of the Industry the very best men should be engaged. In the meantime we think that, so long as the industry enjoys protection, the services of the Sugar Technologist should be available specially to the smaller factories on a moderate scale of fees. Further we recommend that research work on the technical processes of manufacture by vacuum pan and open pan systems by the Technological Institute should be continued.

With the aid of a grant of Rs. 32,610 made by the Imperial Council of Agricultural Research a Bureau of Sugar Standards has been established at the Sugar Institute with the following functions, *viz.* :—

1. Preparing and supplying sugar standards.
2. Maintaining a Museum of supplies of sugar and other sugar products.
3. Publishing annual reviews dealing with the quality of Indian sugars and of competitive foreign sugars.

The sets of Indian sugar standards were ready for distribution in August, 1935, and up to the end of February, 1936, 71 sets were sold—mostly to sugar factories and sugar merchants. The standards are sold at present at Rs. 250 a set. We think that the price should be reduced so as to bring them within the reach of ordinary dealers.

Samples of sugar, gur, jaggery and rab for the museum were collected from different parts of India and were compared with the Indian standards. A report in respect of each sample was sent to the factory concerned and a general review of the quality of sugar samples was compiled and published for the benefit of the industry.

The Director of Sugar Technological Institute, Cawnpore, is responsible for the compilation and publication of statistics relating to the sugar industry. Under the Sugar Production Rules which have been in operation since November, 1935, a number of forms have been drawn up on which factories supply the required information, but no returns are received from some factories and of the returns received some are submitted late and some are incorrectly filled up.

The central sugar factories situated in Indian States were approached through their Political Agents for the supply of returns and most of the factories are now sending them. But some central sugar factories and refineries are not fully co-operating. Elsewhere we suggest the imposition of a penalty for failure to send the prescribed returns. Factories must realise that it is in their

own interest to supply promptly to the Technological Institute correct figures for purposes of consolidation and publication, so that statistical information may be complete, specially in regard to the production and stocks of sugar.

The Technologist is also responsible for the maintenance of the Sugar Cable Service and the Sugar Postal Service containing reliable crop and market reports of sugar in the principal countries of the world and the Sugar Trade Information Service giving daily quotations and weekly reports for sugar from important Indian sugar markets which we understand have been of assistance to the industry.

CHAPTER XIII.

Supplementary Proposals.

Other measures of assistance.

183. The previous Tariff Board was opposed to the investment of Government funds in sugar companies, but commended for adoption in India the practice of British **Financial assistance.** Government granting assistance to sugar interests in various Colonies by means of loans carrying easy or no interest.

Financial assistance by Government to factories has been given in three provinces in India. In the United Provinces a loan of Rs. 6 lakhs was given to the Lucknow Sugar Mills in 1922 for completing and working the concern and another of Rs. 1,20,000 to the Shri Mahalakshmi Sugar Corporation, Limited, Lucknow, in 1924 for the purchase of sugar machinery. The greater part of these loans proved irrecoverable and since then the United Provinces Government have advanced no money to sugar factories. The Government have, however, helped 11 factories to acquire land aggregating over 80 acres for the construction of roads, improving drainage, supplying parking space, etc. A co-operative Open Pan Sugar Factory was allowed the use of Government land on a nominal rent of one rupee, but that factory worked at a loss and had to be closed down.

In Madras a loan of Rs. 50,000 was granted by Government under the State Aid to Industries Act to the Shri Ramakrishna Sugar Mills, Limited, Kirlampudi, in March 1936 for the purpose of discharging a debt due to a bank and for the purchase and installation of additional machinery to enable the factory to increase its capacity from 80 to 120 tons a day.

In the Punjab financial assistance was given to twelve individuals—the sums varying from Rs. 1,000 to Rs. 5,000 for open pan concerns—while a sum of Rs. 1,50,000 was invested in shares of the Sonapat Sugar Factory. The whole of the investment in the Sonapat factory had eventually to be written off as irrecoverable as the Company went into liquidation.

184. It is generally agreed, judging from the experience of Java and other important sugar producing countries that the most economical and progressive form of cane cultivation for factory manufacture is cultivation by factories themselves on land in their possession or under their control. The question was considered by the last Tariff Board who, in agreement with the opinion expressed by the Sugar Committee of 1920, arrived at the conclusion that the compulsory acquisition of land to meet the requirements of factories except, perhaps, small plots for the production of seed

Compulsory acquisition of land.

or for demonstration purposes was entirely unsuited to conditions in India where liberty of cultivation is traditional.

We have again considered the question and find that among factory owners themselves the general consensus of opinion is that the compulsory acquisition of land is not a practicable proposition, but the suggestion has been made that some assistance might be given in the leasing of land to factories which undertake their own cultivation. Whatever may be said for or against controlled cultivation, the fact must be recognised that no legislature in India is in the least likely to accept any measure involving the dis-possession of the small holder for the benefit of factories. We therefore agree with the conclusion of the previous Tariff Board that the compulsory acquisition of land on a large scale is out of the question.

We would, however, make an exception in the case of land required for the construction of tramway systems. There are many localities in which difficulties of cane transport are so great that tramway systems are definitely as much to the advantage of the grower as of the factory. In this connection we have received complaints of the unreasonably obstructive attitude of local bodies to the construction of tramways along the margin of roads. If it can be shown that the construction of a tramway is to the general advantage some restriction on the powers of local bodies to impose unreasonable conditions or impossible terms is, in our opinion, advisable.

We wish to add that we are fully alive to the economic disadvantages of the fragmentation of holdings in the cultivation of sugarcane. So long as cultivation continues in small isolated plots, the introduction of new varieties of cane and improved methods of cultivation calculated to reduce the cost of production must continue to be a slow and laborious process. We would recommend that special encouragement should be given to schemes for the consolidation of holdings in cane growing areas, preferably through the instrumentality of Co-operative Societies.

Our attention has been drawn to the difficulty some factories experience in getting rid of surplus molasses they are unable to sell. We think in the interest of public health that facilities for the acquisition of land for the disposal of molasses should also be given where necessary.

185. It is generally agreed that there is a need for fuller and more detailed information regarding the marketing of sugar. The

Marketing Survey. Sugar Committee of the Imperial Council of Agricultural Research in its meeting held in May, 1937, has recommended that a marketing survey should be undertaken throughout the whole of India covering the following points :—

- (1) Production and marketing of cane in the various provinces and States showing the amount used for different purposes, *e.g.*, eating, preparation of gur and khandsari and the manufacture of refined sugar

- (2) Production, marketing and utilisation of unrefined forms of sugar, *e.g.*, gur jaggery and khandsari.
- (3) Marketing and distribution of imported and factory made refined sugar throughout India.
- (4) Production and marketing of by-products, *e.g.*, molasses, and of manufactured preparations, *e.g.*, syrups, confectionery, etc.
- (5) All matters relating to marketing including the functions performed by the various parties concerned, contracts in use, the finance of distribution, the transport, packing, standardisation of the produce, etc.

186. The lack of complete and accurate statistics, as we have shown, has been a cause of embarrassment to the Sugar Industry, especially on the marketing side. To meet its requirements statistical information is necessary of the acreage and production of sugarcane, of the imports and internal production of sugar, of the movements and stocks of sugar and finally of its selling price at important centres.

As regards acreage of cane, in Provinces and Indian States, the land revenue system which necessitates a survey and record of holdings and of the crop grown from year to year, the figures may be considered to be reasonably accurate but in those parts of India where a permanent settlement of land revenue obtains and no necessity arises for a record of individual holdings the estimates of area are, we are informed, no better than guesses. Figures from the Punjab, United Provinces, Central Provinces and Berar, Bombay and Madras may be considered approximately correct, but in Bihar, Bengal, Assam and Orissa the possible margin of error is considerable.

In regard to estimates of yield the position is even less satisfactory. At one time, in some Provinces, a series of crop cutting experiments on typical fields was conducted which furnished data for estimating average yields per acre. It is unfortunate that those experiments have for the most part been discontinued. Present estimates of yield must, we are told, be accepted with considerable caution.

Accurate figures are available of imports, but it is anomalous that sugarcandy should be included under the head of sugar when other forms of confectionery are shown separately. For statistical purposes it is advisable to keep the two separate especially as the rates of import duty are different.

Figures of internal production are based partly on actual returns from factories and partly on estimates. In the case of vacuum pan factories and refineries, the returns sent to the Technological Institute at Cawnpore for consolidation are incomplete and often delayed. It appears to us that insufficient use is made of the information furnished by factories for purposes of the excise duty.

The Indian Sugar Mills Association state that in the interest of the industry it is important that complete and accurate figures of production and stocks should be furnished promptly by factories and published as early as possible by the Technological Institute and agree that the prescription of penalties for failure to send returns in time is necessary.

In the case of sugar manufactured by the open pan method commonly known as khandsari sugar, concerns which are large enough to be classed as factories and pay excise duty are under an obligation to furnish information of their production for excise purposes. No information is available of the production by small concerns which do not come under the Factory Act. The published estimates of production are open to question and, judging from the information we have received on the number of open pan concerns which have closed down in recent years, are probably over estimates. An annual census of open pan concerns would not be difficult to make and would serve as a basis for estimating production more accurately than at present.

As regards stocks at ports and other marketing centres little reliance can be placed on the information at present furnished, so we are informed by the Indian Sugar Mills Association. The question of improving the method of reporting stocks is one of the matters which may well be considered in the course of the marketing survey which we have elsewhere suggested as advisable. The form in which information is published of the movements of sugar and stocks held at marketing centres should also receive attention, bearing in mind that figures of foreign imports are now comparatively unimportant and that the main movement of sugar is from the United Provinces and Bihar to importing provinces.

In the matter of prices, wholesale price figures are published but not retail figures. In view of the growing importance of sugar relatively to gur, the publication of retail prices of sugar is a matter deserving consideration.

The statistical information published of the production, movements and prices of gur and molasses is of doubtful value. In the case of gur the difficulties of arriving at even an approximate estimate of production are very great. The possible margin of error is considerable and it is admitted that little reliance can be placed on the present estimates.

Statistics of the production of molasses are likely to become of increasing importance. Returns of production can be obtained from vacuum pan factories and refineries and an estimate made of the output by other processes. We recommend that the figures should be compiled and published monthly. In rail-borne statistics gur, rab, jaggery and molasses are classified under the same head. We recommend that figures of molasses should be shown separately.

187. Certain simple parts such as cast iron tanks and pipes and other plants comparatively easy to manufacture are obtainable

in India. In the latter category are included crystallisers, Manufacture of centrifugal machines, dryers, sugar sifters Sugar Machinery in and sulphur ovens. India.

It is satisfactory to note that the mills are alive to the desirability of meeting their requirements so far as possible within the country, but we are told by the Indian Sugar Mills Association that sugar machinery is of a specialised manufacture and most of it at present has to be imported.

Labour Conditions.

188. The last Tariff Board referred to the considerable employment by sugar factories of the agricultural classes in the period Employment of Labour. between the *kharif* and *rabi* harvests when agricultural operations are slack and gave such employment of labour as an additional argument for protection to the industry.

With the rapid development of the manufacture of Indian sugar since the Board reported, the employment of labour has greatly increased. The erection of a sugar factory itself provides employment both in the engineering and building trades. After the erection, when the factory begins to work, labour is required for the handling of raw materials for the various factory processes and for the despatch of finished products.

At the same time, the Sugar Industry is responsible for indirect employment in other industries—in the transport of manures, seed and implements and of the bulky sugarcane crop to the factory, in the supply and transport of machinery, coal, coke, limestone, bags, etc., required by the factory and in the distribution of sugar and its by-products.

189. The average daily number of workers employed in sugar factories in British India is estimated to be over 73,000. We have

Number employed. given in Appendix C the staff which a factory of 500 tons capacity should employ. On this basis, taking the present number of factories, we estimate that the industry should employ 20,000 skilled or semi-skilled and 75,000 unskilled workers. The labour employed is mainly Indian, the only foreigners being some panmen (usually Chinese) and a few engineers and chemists. It seems probable that eventually even these will be replaced.

In regard to the remuneration paid to the different grades of labour and to the tenure of employment the situation is not generally satisfactory. In a protected industry it is to be expected that the labourer in the factory should also share in the benefits of protection, but we find that the interests of labour have not received the consideration they deserve. For example, complaints have been made that the hours of work are longer than those permitted by the Factory Act and that in certain factories labourers after doing their full work during a shift are put on to additional duties such as loading or unloading of wagons, etc. There is also

a general complaint from skilled labour that, in their case, there are, in practice, only two shifts a day of 12 hours each and that they are not paid overtime for the extra hours worked. In Chapter V we have made specific suggestions as to the rates of wages and terms of employment.

190. In foreign countries labour is well looked after and its comfort is the first concern of the factory owner. In the United Kingdom sugar factory workers have a number of advantages. For instance, the general staff and factory workers are allowed a week to one month's vacation with full pay in the off season. Very often the factory defrays the whole or part of the cost of its workers' travelling to the nearest town or village and back or makes special arrangements with railways for reduced fares. Moreover, housing accommodation is, as a rule provided for all superior and technical staff and also for ordinary workers. Besides, welfare facilities are provided in every factory. All these advantages constitute a substantial addition to a worker's wages. In the case of labourers who have to be dispensed with in the off season, there is a practice of placing them on a list and giving them the first chance of re-employment in the following working season.

191. In India the position is not the same. As a rule, unskilled labour is recruited from the villages in the neighbourhood of factories and no accommodation is provided for them in factory colonies. Housing conditions. In the case of skilled labour and technical staff the practice varies: the majority of the mills provide well built quarters but some mills have not made adequate provision. The present houses provided for semi-skilled workers are not satisfactory and sometimes five or more persons live in one room. We feel that suitable housing accommodation should be provided by every factory for all grades of skilled or semi-skilled labour and in the case of seasonal labour housing arrangements for at least a portion of the workers should be made. Factory surroundings and sanitation at present are not always satisfactory and it is to be regretted that inspection of factories is not as regular as it should be. We are informed that for want of adequate staff factories in United Provinces are inspected only once a year and sometimes less often.

192. Turning to welfare work, it may be considered under three heads—medical relief, education and recreation. The practice varies with the size and standing of mills. Welfare work. Speaking generally, well established concerns do more for their staffs than some of the newer factories.

A large number of factories maintain dispensaries and give free medicine and medical treatment to their workers. Similarly, a number of factories have opened primary schools for workers' children or make contributions to local schools. Practically no charge is made for the education imparted and we understand that scholarships are sometimes given to promising pupils. It is interesting to note that one modern factory has provided a radio set.

The arrangements for recreation, however, are not so satisfactory. Only a few factories have recreation grounds and sports clubs and little provision is made for indoor amusements.

On the whole, it cannot be said that factories have paid sufficient attention to welfare work. But the extent of welfare work depends upon the stability of the industry. Unless the manufacturer feels that he can make a reasonable profit, he cannot afford to be liberal in his treatment of his employees. The excise duties coming one after the other within the first half of the protective period have curtailed the welfare work of the manufacturers who are anxious to provide comforts for their workers. But if the fair selling price of sugar we have recommended can be realised, there is no reason why there should not be a distinct improvement in the condition of labour and in the relations between the manufacturer and his employees—a matter of great importance—for the success of the protective scheme whose aim is to benefit all sections of the industry.

Subsidiary Industries.

It is generally agreed that there are possibilities of establishing industries subsidiary to the sugar industry, such as the manufacture of sweets and syrups, fruit preservation and canning. From the information we have received we find that a few factories are producing sweets and one or two factories are experimenting in the manufacture of syrups.

193. The manufacture of confectionery has become of increasing importance in recent years. Formerly the sugar used in

making confectionery was all imported, but it is being gradually replaced by Indian Confectionery. sugar. Messrs. Parle Products Company, Bombay, we are informed, use entirely Indian sugar, but what they require is sugar of better quality and better grain. For making certain high classes of sweets, however, corn sugar or glucose is imported from England, Holland and also from Italy. It is an indispensable raw material for high class confectionery and is not at present produced in India. Glucose is made from starch and starch is not manufactured to any considerable extent in India, but we understand that a factory is shortly to be erected in Ahmedabad.

It has been represented to us by Messrs. Parle Products Company, Bombay, that if a rebate on imported sugar is allowed it would help them in developing the export of confectionery to Ceylon, Afghanistan, and the Persian Gulf markets. The argument advanced in support of this demand is that the quality of sugar used in the confectionery industry is not at present available in India and in some countries such rebate is given. On the other hand, if such a rebate is given on imported sugar it might deter factories from taking up the manufacture of the quality of sugar required. The Company has also suggested that the industry can be expanded if it is allowed a refund of sugar excise duty on the sugar used in the manufacture of confectionery. The matter, we

understand, has been already represented to Government in connection with the small industries enquiry.

We give below a Table showing the imports of foreign confectioneries:—

TABLE LIX.

Years.	Cwts.	Rs.
<i>Imports of canned or bottled fruits—</i>		
1934-35	46,546	10,90,804
1935-36	43,287	11,23,025
1936-37	44,857	10,16,393
<i>Imports of confectionery—</i>		
1934-35	27,200	17,92,824
1935-36	33,690	21,53,670
1936-37	37,233	22,89,858

The question of developing subsidiary industries to sugar is now under investigation by several provincial Governments, *e.g.*, United Provinces, Madras and the Punjab. The Bengal Government observe:—

“ * * * But the largest use of sugar is made in the manufacture of various kinds of confectionery and the best and most effective means of the increase in the consumption of sugar will be to encourage by State help the manufacture in Bengal of such confectioneries as lozenges, sweets, chutneys, biscuits and cakes which have good possibilities in this province so as to obviate the present large import of foreign confectioneries.”

Some of the confectionery manufactured in India compares favourably in quality with the imported article, and we see no reason why the industry should not develop though there will always be a demand for certain high grade classes of confectionery from abroad.

The present rate of import duty on confectionery is 50 per cent. *ad valorem* with a preferential duty of 40 per cent. *ad valorem* if the article is the produce or manufacture of the United Kingdom. We have received no representation on the subject of the rates of duty and, therefore, we have no recommendation to make.

194. There are two kinds of sugarcandy, ‘tal’ candy manufactured generally by factories and ‘kunda’ candy, the manufacture of which is a cottage industry spread all over India. Sugarcandy manufacture has been started only recently by a few sugar factories in India. In Bengal three factories are now making ‘tal’ candy, one of which we have visited. As for ‘kunda’ candy, the Director of Industries, Bombay, made a special survey in 1933 and found that there were 32 sugarcandy concerns, but the industry was suffering from Japanese competition on account of the devaluation of yen.

The previous Tariff Board had recommended that the same duty of Rs. 7-4-0 per cwt. should apply to sugarcandy as to other classes of sugar. In April, 1932, sugarcandy was classed with sugar and a uniform duty of Rs. 9-1-0 per cwt. (Rs. 7-4-0 *plus* revenue surcharge of Rs. 1-13-0) was levied. In order to protect this cottage industry Government raised the import duty on sugarcandy in February, 1934, from Rs. 9-1-0 per cwt. to Rs. 10-8-0 per cwt. or Rs. 210 per ton at which level it has remained ever since.

We give in the following Table the imports of sugarcandy into British India and the amount of duty collected between the years 1934-35 and 1936-37:—

TABLE LX.—*Imports of Sugarcandy into British India.*

Year.	Estimated Quantity.					Amount of duty collected.
	Tons.					Rs.
1934-35	2,332*					4,89,785
1935-36	2,310					4,85,172
1936-37	2,200					4,61,950

* According to special returns the actual quantity of sugarcandy imported during the eleven months, April, 1934, to February, 1935, amounted to 2,557 tons.

In spite of the increase in the import duty in 1934 imports still continue on a fairly considerable scale.

195. Sugarcandy is not sold wholesale, as there is no large market for it. Its retail price varies from Rs. 9-8-0 to Rs. 10-12-0

Duty considered. while the price of imported candy in October, 1937, was Rs. 12-8-0 per maund. Thus we find that there is a difference of Rs. 2 to Rs. 3 per maund in the two prices, but this is said to be due to the superior quality of the imported commodity. So long as the quality of Indian sugarcandy is not improved, imports are likely to continue but in view of the wide margin of difference between the prices of imported sugarcandy and Indian sugarcandy we do not think we would be justified in recommending an increase in the present rate of duty.

CHAPTER XIV.

Consequences of Protection.

196. Our terms of reference require that in making recommendations regarding the extent of protection during the next Government revenue. eight years we should take all relevant considerations into account, including that stated in part (b) of the resolution adopted by the Legislative Assembly on the 16th February, 1923. Part (b) of this resolution reads as follows:—

“ That in the application of the above principle of protection regard must be made to the financial needs of the country and to the present dependence of the Government of India on import, export and excise duties for a large part of its revenue.”

We have given in detail in Chapter III the rates of duties imposed on sugar for revenue purposes from time to time. We give below a Table showing the revenue derived from import, and excise duties during the last seven years.

TABLE LXI.

Year.	Revenue from import duty.	Revenue from excise duty.
	(In lakhs of Rupees.)	
1930-31	10,81	...
1931-32	6,19	...
1932-33	6,84	...
1933-34	4,72	...
1934-35	3,81	97
1935-36	3,24	1,58
1936-37	51	2,53

It will be seen that the revenue from imported sugar was no less than Rs. 10½ crores in 1930-31, but with the imposition of the revenue surcharge in September, 1931, before the protective duty came into effect, the amount had fallen to Rs. 6 crores in 1931-32. In 1934-35, the year when the first excise duty of Rs. 1-5-0 per cwt. was levied the revenue realised was Rs. 4 crores. In 1936-37, the customs revenue fell to Rs. 51 lakhs while the excise revenue increased from Rs. 97 lakhs to Rs. 2½ crores. The Hon'ble Finance Member while proposing to increase the excise-duty on the 27th February, 1937, from Rs. 1-5-0 to Rs. 2 a cwt. spoke in the following terms:—

“ It is hardly necessary to emphasise the tremendous strain which a loss of Rs. 7 or 9 crores in the yield of the consumption tax on a single commodity must impose on the finances of a country. The present level of internal prices is such that the consumer even when he has fully shouldered the burden of

an additional 11 annas a cwt. will be paying no more for his sugar than he was until a very recent date. As regards the manufacturer I have already mentioned the plight to which over production has reduced the industry. In so far as the enhanced excise will check the tendency by eliminating the weak and inefficient producer it will have a salutary effect, and by arresting further deterioration will preserve the position pending the fuller enquiry which is shortly to be held by the Tariff Board. For the same reason I believe that the effect on the cultivator will also be beneficial, for it is no advantage to him to be induced to grow cane for supply to a precarious manufacturer who can not be relied on to take the crop off his hands. I estimate the additional revenue from the increase in the sugar excise at Rs. 115 lakhs."

197. The revenue surcharge of 25 per cent. imposed in September, 1931, increased the Customs revenue by Rs. 50 lakhs in 1932-33, but there was a drop of over Rs. 2 crores the following year because the effective measure of protection was increased beyond the recommendations of the Tariff Board to a level which was in its ultimate result prohibitive. The rapidity of the development of the industry and of the consequent decline in imports of sugar appears to have been underestimated.

198. In order to compensate for the loss of revenue from imports the Government introduced an excise duty in April, 1934. The main line of criticism by the Indian Sugar Mills Association was that the imposition on an infant industry of an excise duty was premature.

The rise in sugar prices from Rs. 8-4-0 in March to Rs. 9-0-0 per maund in May, 1934, indicates that the burden of the duty was borne mainly by the consumer. The duty had no effect on the price of cane and so did not adversely affect the cultivator.

As one month's notice was given by Government before the duty came into effect, the market was able to adjust itself to new conditions and an examination of the balance sheets suggests that many factories were still able to earn a fair return on capital. The duty nevertheless pressed heavily on newly started factories and on the factories which had been damaged by the earthquake of January, 1934.

On the other hand, it may be said that the excise duty of 1934 had a steady influence on the industry in so far as it put a check on the flotation of inefficient concerns.

199. On 28th February the excise duty was increased by 11 annas a cwt. but on this occasion the month's notice given in 1934, was dispensed with. The enhanced Excise duty of 1937. duty was rejected by the Legislative Assembly but was certified by the Governor General in Council.

The imposition of this additional duty in the middle of the working season without notice provoked widespread criticism. The

Indian Sugar Mills Association, the Bihar Planters' Association and the Bihar Cane Growers' Association submitted a joint memorandum to Government based on the following points:—

1. Enhancement of excise duty was premature in view of the impending Tariff Board enquiry.
2. The duty should not have been imposed without notice in the middle of the crushing season, as it created complications in dealings between factories and merchants.
3. The burden of the duty would fall not on the consumer but on the factories and the agriculturists.
4. With sugar selling at Rs. 6 per maund a duty of Rs. 1-8-0 represented a tax of 25 per cent. which was excessive.
5. The fall in Government revenue from the import of sugar calculated on the basis of the year 1930-31, gave a wrong impression, as it was a year of exceptionally large imports. In 1930-31, the Customs revenue was Rs. 10 $\frac{3}{4}$ crores, but in the four preceding years it was approximately Rs. 7 $\frac{1}{2}$, 6 $\frac{1}{2}$, 7 $\frac{3}{4}$ and 8 $\frac{1}{2}$ crores.
6. As against the decline from import revenue should be set, as a result of protection, increase in customs duty on sugar machinery, increased income-tax and super-tax not only from factories but also from their staff and from other trades supplying materials to the sugar industry, and increased revenue to Indian Railways.
7. The pressure of the duty was likely to drive the industry into the Indian States, where even if excise duty was imposed, numerous concessions and advantages, including the manufacture of power alcohol were granted and where entry of sugar from British India was often subject to restrictions without reciprocity (Gandhi's Sugar Annual, 1937, pp. 32-33).

In view of the repercussions of the increased excise duty of 1937 on all branches of the Sugar industry, we have given special attention to the subject and examined the representatives of provincial Governments, besides receiving evidence from individual mills and the Indian Sugar Mills Association.

Consequent on the increase of excise duty the sugar prices rose by a few annas, but this rise unlike 1934, was only temporary and for a few days after which prices fell to even lower levels than before. The duty had thus no effect on the consumer.

At first sight, it appears contrary to the normal working of economic laws that an increase in excise duty should not have had the effect of raising prices in the case of a commodity of general consumption like sugar. The position was, however, complicated by the fact that, owing to a variety of causes which we have explained elsewhere, sugar prices were already on the decline. The excise duty at such a juncture constituted a disturbing element and accentuated the difficulties of the situation.

As already explained factories in the United Provinces and Bihar, fearing that manufacture could be continued only at a loss, threatened to close down but on the intervention of the provincial Governments in the interest of both the cultivator and their own revenues, were persuaded to continue operations on the understanding that the cost of raw material would be reduced. The minimum prices of cane were lowered from 4 annas 3 pies in March to 3 annas 6 pies in May in the United Provinces and from 4 annas 3 pies to 3 annas in Bihar.

According to the Hon'ble Minister of Industries, United Provinces, these reductions in minimum prices were made in order to allow for the increased excise duty and the deterioration in the quality of cane owing to the lateness of the season. The situation arising from the enhancement of the sugar excise duty and the consequent loss likely to be caused to the cultivators of sugarcane was brought to the notice of the Central Government in March, 1937, and later a further representation was made on the subject.

In these two provinces which are responsible for 83 per cent. of the total output, the burden of the new duty was passed on for the most part to the cultivator. According to our estimate the difference between what the cultivators in these provinces might have received for their supply of cane to factories in March, April and May, 1937, at prices prevailing before the month of March and what they actually received is about 40 lakhs of rupees.

In other parts of India the position was not quite the same. In some cases the price of cane was reduced, but in the case of factories which grew their own cane or had entered into a previous contract for the supply of cane at fixed prices, the burden of excise duty fell on the manufacturer. This is illustrated by the following statement relating to a factory of over 1,000 tons. The position of smaller factories was probably worse.

TABLE LXII.

—	1934-35.	1935-36.	1936-37 (end of February).	1937.		
				March.	April.	May.
	Rs. per ton.	Rs. per ton.	Rs per ton.	Rs. per ton.	Rs. per ton.	Rs. per ton.
1. Average cost of producing sugar.	209-08	171-08	167-13	155-79	157-55	164-08
2. Average selling price . .	253-42	244-12	216-40	206-75	195-63	188-50
3. Margin of profit . . .	43-44	72-19	49-27	50-96	38-08	23-52
4. Excise duty . . .	26-25	26-25	26-80	40-00	40-00	40-00
5. Percentage of excise duty to margin of profit (item 3).	60-40	36-40	53-60	78-40	105-06	170-10

200. The Indian Sugar Mills Association do not object to the excise duty in principle so long as the industry is in a position to pay it. According to the Fiscal Commission Report the principle of an excise duty is that it should yield revenue provided that it does not press too heavily on the poor and in the case of an industry requiring protection the duty does not entrench on the degree or character of such protection.

Actually the enhanced excise duty has affected the cultivator, the manufacturer and the factory employee. At the level of prices prevailing since November, 1936, the amount of excise duty bears as high a proportion as 24 per cent. to the price realised. The excise enhancement of 1937 forced employers to reduce their staff and to cut down salaries. From our examination of balance sheets we find that many factories incurred losses in 1936-37 and some of those who have made a profit have done so largely at the expense of the cultivator.

The adverse effects on the industry in general and the cultivator in particular have been subject of adverse comment on the part of all the provincial Governments concerned as well as non-official witnesses. To quote the Government of the United Provinces:—

“ but for the enhancement in the excise duty factories would not have decided to close down early and so the crisis would not have been so acute as it actually became In practice the greater part of the direct burden was borne by the cane grower: factories and merchants suffered also indirectly because owing to the reduction in the minimum price of cane, the price of sugar went down and so those who held stocks of sugar had to bear the losses ”.

According to the Government of Bihar—

“ the additional duty imposed in 1937 came at a very unfortunate moment when the grower was in critical position on account of the heavy overproduction of cane. As a result of the excise the scale of minimum prices had to be reduced and eventually further reductions were necessary in order to induce the sugar factories to prolong their crushing season; the growers undoubtedly did suffer to an appreciable extent on account of the additional duty ”.

From the foregoing analysis the conclusion is forced upon us that in the peculiar circumstances of the Sugar Industry a change in the level of excise duty without notice in the middle of the working season leads to unexpected complications and undesirable consequences. Unless the price of sugar can be raised to a level approaching the fair selling price suggested by us for the remaining period of protection, we doubt if the present level of excise duty can be maintained without detriment to the industry and particularly to the interest of the cultivator.

It has been represented to us that the excise duty should be replaced by a special levy on profits which according to Messrs. Beggs

Sutherland and Company, the industry could have accepted with comparative equanimity. The suggestion is one which, in our opinion, deserves examination.

The point has also been raised by the Bengal Chamber of Commerce that the amount of Excise duty should be fixed under the Sugar Protection Act and should be taken into consideration, when determining the measure of protection and should not be subsequently changed without previous investigation by a Tariff Board. We observe that under the British Sugar Industry Act a duty is imposed upon the Sugar Commission to make recommendations as to the levy of an excise duty without undue disturbance to the industry. On this analogy we think that previous investigation by a statutory body of changes in the excise duty is desirable.

201. We shall next consider the incidence of the excise duty on different classes of sugar manufactured by different processes described in Chapters VI and VII to which our attention has been directed.

Sugar manufactured by the vacuum pan process from sugarcane and sugar manufactured from gur by refineries bear the same amount of duty Rs. 1-7-6 per maund. The duty on khandsari sugar is 11 annas 9 pies per maund. Under Section 3 (2) (iii) of the Sugar Excise Act the duty on palmyra sugar defined as sugar manufactured from jaggery obtained by boiling the juice of the palmyra palm, is to be at such rate as may be fixed by the Governor General in Council, after such enquiry as he may think fit. No excise duty has, hitherto, been levied.

The following Table shows the fair selling prices of the four classes of sugar at which we have arrived in Chapters VI and VII and the rate of excise duty on each:—

TABLE LXIII.

	Fair selling price.	Excise duty.	Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
Sugar manufactured from cane by vacuum pan process	6 13 10	1 7 6	8 5 4
Refinery sugar	7 7 0	1 7 6	8 14 6
Palmyra sugar	7 11 6	Nil.	7 11 6
Khandsari sugar	6 14 7	0 11 9	7 10 4

202. Refinery sugar, according to our calculations, is at a considerable disadvantage in comparison with the other three. It

Refinery sugar. is not an economical process of manufacture and the justification for its continuance is that it provides an outlet for surplus gur and enables factories which have a refinery plant attached to them, to continue operation after the cane crushing season is over. Individual refineries have complained of the high rate of excise duty, but the Indian Sugar

Mills Association, as a body, have decided to make no representation in this regard.

203. Palmyra sugar is at an advantage of 9 annas 10 pies in comparison with ordinary sugar in the area where an efficient

refinery is at present working or 13 annas

Palmyra sugar. 10 pies if allowance is made for difference in quality. It is possible that a Company recently formed to operate in another area where the cost of raw material is lower may be able to manufacture more cheaply as we have shown in Chapter VII.

The only justification for the continuance of the exemption from excise duty is that these refineries provide an outlet for palmyra jaggery and so give employment to tappers and their families whose hereditary profession is the tapping of palm trees. The Madras Government have strongly recommended the continuance of the present special concession. The Indian Sugar Mills Association have not made any representation on the subject. If the present exemption is to continue it should be on the condition that the manufacturers pay a fair minimum price for jaggery to the tappers which should be not less than Rs. 19-8-0 per candy of 500 lbs.

204. Khandsari sugar with the reduced rate of excise duty is at an advantage of 11 annas in comparison with ordinary sugar

Khandsari sugar. but this advantage is more than offset by the inferior quality of the sugar produced.

This branch of the industry has continued to decline in spite of the lower rate of excise duty.

205. We shall now consider the fair selling price of sugar in relation to present actual price. We give below a Table showing

Comparative prices. the average *ex*-factory price of ordinary vacuum pan factory sugar in November, 1937, compared with the fair selling prices we have estimated. In the case of refinery sugar and palmyra sugar we have added 4 annas a maund to the price of ordinary sugar for difference in quality. In the case of khandsari sugar we have deducted 12 annas a maund which according to our estimate represents the difference in quality.

TABLE LXIV.

—	Fair selling price includ- ing excise duty at present rates.	Present price.	Difference between Columns 1 and 2.
	1	2	3
	Rs. A. P.	Rs. A. P.	Rs. A. P.
Sugar manufactured from cane by vacuum pan process	8 5 4	6 14 0	1 7 4
Refinery sugar	8 14 6	7 2 0	1 12 6
Palmyra sugar	7 11 6	7 2 0	0 9 6
Khandsari sugar	7 10 4	6 2 0	1 8 4

The Governments of the United Provinces and Bihar, the main sugar producing area, have fixed the minimum price of cane at 5 annas 3 pies per maund with a reduction of 3 pies for 'rail' cane for the 1937-38 season. We are not aware on what basis this price has been fixed, but the figure of 5 annas 3 pies happens to be the same as the figure at which we have independently arrived as the fair selling price of 'gate' cane. Taking 5 annas 6 pies as the cost of cane delivered at factory, we have arrived at the conclusion that the average cost of manufacture without profit by a vacuum pan factory is Rs. 5-14-7. Adding Rs. 1-7-6, the excise duty, an average factory according to our calculations will be selling at a loss of about 8 annas per maund. As an irreducible minimum price for cane has been fixed in the United Provinces and Bihar, the burden of the excise cannot be passed on to the cultivator. It will, therefore, fall on the manufacturer unless he can pass it on to the consumer by raising the price of sugar. We understand that the Governments of the United Provinces and Bihar have realised this difficulty and are endeavouring to strengthen the position of the recently formed Selling Syndicate by compelling all factories in the two provinces to join the organisation, but we are not aware if any steps have been taken to induce factories in other provinces and in Indian States to co-operate in raising prices.

206. The present position of the industry is, in our opinion, critical. Leaving imports out of account, internal production, as we have shown, is already in excess of consumption, and is likely to increase in 1937-38 with the opening of new factories.

On the other hand, if prices are raised, bearing in mind the fact that it is always possible for the poorer class of consumer to fall back on gur as a substitute for sugar, consumption is not likely to expand and may even decline below the level of 1936-37, when the unprecedented low price of sugar gave an abnormal stimulus. India is debarred from export by sea except to Burma and there is no immediate prospect of developing an export trade by land. No outlet can, therefore, be found for the surplus production and the accumulation of stocks must have a depressing effect on prices. The position has thus been reached that a rise in prices is necessary for the reasons already stated, but overproduction should normally have the effect of driving prices down.

207. The prospects of the Selling Syndicate being able to raise prices appreciably must be considered uncertain. If the price can

Conditions under be raised to Rs. 8-5-4 per maund, ordinary which excise duty can vacuum pan factories will be able to earn be levied. a reasonable profit, but refineries will still find it difficult to work. Palmyra sugar according to our calculation could bear an excise duty of 12 annas a maund with a fair margin of profit. Khandsari sugar will still be able to bear the excise duty at the present rate but no more.

In the matter of khandsari sugar our attention has been drawn to the fact that the excise duty is leviable only on sugar produced

in concerns classified as factories, *i.e.*, concerns employing 20 persons or more. Consequently the duty is evaded by splitting up the process of manufacture into two parts located in different buildings as explained in Chapter VII. Another point for consideration is that small concerns employing less than 20 persons who are at present exempt from excise duty have no incentive to increase their efficiency by installing larger and more economical machinery because it would not pay them to do so if the extension of their plant resulted in a liability to pay excise duty. In order to prevent the evasion of the duty and to encourage an increase in the efficiency of production by the installation of larger and more economical centrifugal plants, it appears to us a matter deserving consideration whether the duty cannot be levied in some other way. If, instead of the levy of a duty per maund of sugar manufactured by concerns employing 20 persons, a fixed monthly fee were levied on all centrifugals according to their size and estimated outturn of sugar, the incidence of the duty would be more fairly and evenly distributed over the whole khandsari industry, there would not be the same incentive to evade the duty and the total revenue would be increased. As centrifugals are not machines which it is easy to conceal, the danger of evasion of the duty will not be great, nor is there much probability that khandsaris will revert to the almost obsolete 'khanchi' method of manufacture provided that the fees levied on centrifugals are not pitched too high.

208. Lastly, we shall consider the question of what amount of revenue may be expected in future from customs duties on imported

Necessity for all-India Conference.	sugar and excise duty on internal production. According to present indications the revenue from the duty on imported sugar will fall in 1937-38 to an even lower figure than in 1936-37. There is no reason why Indian sugar should not in time replace the special qualities of sugar still imported, in which case there will be a further shrinkage of revenue to an almost negligible figure.
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As regards revenue from excise duties, we must consider the position which will arise if it is found impossible to raise prices above the present level.

If the manufacturer is unable to pass the burden of the excise duty on to either the grower of cane or the consumer, it will be impossible for the average factory to continue working except at a loss. From every point of view the consequences will be most serious. If a Selling Organisation on a voluntary basis fails, as a similar organisation in Java failed, we can see no alternative to some form of State intervention.

In our opinion the time has come for the rationalisation of the industry under some form of State control. In earlier Chapters we have indicated that the fixation of a minimum price for cane involves the regulation of cane production and ultimately of sugar production. The NIVAS organisation in Java or the Sugar Corporation in Great Britain may serve as models, but will require modification to suit the peculiar conditions of India. Organisation must

be on an all-India basis since almost all provinces and many Indian States are concerned. We, therefore, recommend that an all-India Conference be convened at as early a date as practicable in which all interests should be represented.

Failing the rationalisation of the industry under State control, we doubt if the excise duty can be maintained at the present level. The effects of a reduction of the duty on the revenues of the Central Government will obviously be serious, but we see no alternative to such a reduction unless the price of sugar can be stabilised at a level which will allow of the payment of a fair price for cane to the grower and a reasonable margin of profit to the manufacturer.

CHAPTER XV.

Summary.

(1) An event of importance to the World Sugar Industry was the signing of the International Sugar Agreement in London.

(2) The policy of discriminating protection in the case of the Sugar Industry has been successful beyond expectation in increasing the internal production of sugar and reducing the imports of foreign sugar.

(3) The production of sugarcane in India which in 1936-37, exceeded 4 million acres is generally adequate for the requirements of sugar and gur manufacture taken together.

(4) The area under improved varieties of cane is generally adequate for the requirements of factories but there is room for improvement in the quality.

(5) The number of vacuum pan factories crushing cane and refineries was 149 in 1936-37 and is likely to increase to 158 in 1937-38.

(6) The production of sugar in India by all processes in 1936-37 was 1,254,000 tons, 53,000 tons in excess of the estimated consumption.

(7) We have examined the cost of sugarcane cultivation in all sugar producing provinces and we have come to the conclusion that 4 annas 3 pies is the fair price for the grower including profit.

(8) The price of sugarcane delivered at factory as calculated by us is 5 annas 6 pies per maund.

(9) We have gone into the details of the costs submitted by factories in all provinces and we have arrived at Rs. 1-12-0 as the cost of manufacture exclusive of overheads.

(10) The progress in manufacturing efficiency made by the industry since 1930-31 has been satisfactory.

(11) We have assumed for purposes of calculation the economic unit of 500 tons crushing capacity for a factory working 130 days in a season of 150 with a recovery of 9·5 per cent.

(12) On this basis the cost of manufacture in a representative factory including overheads and profit is Rs. 6-13-10 per maund.

(13) For the purpose of deciding the extent of protection for the Sugar industry for the remaining period of protection it is necessary to take into consideration the fact that internal production of sugar is now in excess of consumption.

(14) India is debarred from exporting sugar by sea except to Burma, which was already a market for Indian sugar, and export of sugar by land is, in present conditions, impracticable to any considerable extent.

(15) An increase in consumption will be inadequate to absorb surplus production.

(16) In these circumstances an increase in imports would have the most serious consequence for the industry.

(17) It is possible that Java sugar could be landed at ports at a price of Rs. 2-7-0 per maund.

(18) In determining the amount of protection required for the remaining period of protection it is necessary to take into consideration the question of freight to markets in coastal provinces from the area where the great majority of factories are situated. Indian sugar is generally inferior in quality to Java sugar to the estimated extent of five annas a maund.

(19) Taking all factors into consideration the extent of protection required for the remaining period of protection is Rs. 7-4-0 per cwt. (Rs. 5-5-0 per maund). Adding the excise duty of Rs. 2 per cwt. we recommend that the present rate of import duty of Rs. 9-4-0 per cwt. be continued.

(20) The main by-products of sugar manufacture, molasses and bagasse, are of great importance.

(21) No outlet can be found for half the molasses at present produced and the price obtained for the quantity sold is so small that no deduction from the cost of manufacture on this account can be made.

(22) There is no probability of a development of the export trade in molasses beyond the quantity already exported.

(23) We recommend the manufacture of power alcohol for admixture with petrol as the only possible means of absorbing surplus molasses.

(24) The possibilities of utilising bagasse for the manufacture of paper boards deserve further investigation.

(25) The marketing organisation of the Industry is in many respects defective.

(26) The standardisation of Indian sugar is now practicable and desirable.

(27) Until Indian sugar is standardised, a 'Futures' or 'Terminal' market is impracticable.

(28) With the increase in production the price of sugar in India has ceased to be governed by the world price or the price of imported sugar and is now determined by internal competition.

(29) The consumer has every reason to be satisfied with the policy of protection. He is paying less for sugar than he paid before the advent of protection. The price of sugar in India is today cheaper than in any country in the world except Cuba, Java and Brazil.

(30) Present possibilities of export of Indian sugar by sea or land except to Burma are uncertain. We have examined the possibility of export of raw sugar to United Kingdom and find that it is possible after the expiry of the International Sugar Agreement.

(31) While the production of sugar by vacuum pan factories crushing cane has rapidly increased the quantity of sugar produced by refineries, khandsari and open pan concerns has since 1934-35 steadily declined.

(32) The production of gur has been doubled since 1930-31. The fall in the price in 1936-37 suggests that in some areas there was overproduction.

(33) Sugar has to some extent taken the place of gur. Since sugar and gur are largely interchangeable as ingredients in food and drink the quantity of sugar consumed by the class of consumer who uses both gur and sugar is, to some extent, dependent on its price relatively to the price of gur.

(34) Experiments on the improved methods of gur manufacture should be continued in order to improve the quality.

(35) No special protection is necessary for the gur industry apart from the protection granted to sugar which covers gur.

(36) Research work on the agricultural side of the Sugar industry is inadequate in comparison with other sugar producing countries: in particular research work on insect pests and diseases which are responsible for appreciable damage to the sugarcane is very backward.

(37) Sugarcane research is on right lines and has made good progress at Coimbatore, but the method of translating the results to the ryots' fields is far from satisfactory. The two most urgent needs are an increase in the number of testing stations in provinces and an improved system of trial in experimental plots both in cultivators' fields and in factory farms.

(38) The Coimbatore Research Station should be expanded to provide for new lines of investigation.

(39) An allotment of 3 annas per cwt. from the excise duty is recommended for central research and assistance to provincial agricultural departments.

(40) Research work on the technical processes of manufacture by vacuum pan and open pan systems by the Technological Institute should be continued.

(41) We recommend a Marketing Survey of the Sugar Industry and the publication of more complete and accurate statistical information.

(42) We have examined labour conditions in factories and find they are not altogether satisfactory. We recommend that scales of salaries and terms of employment be improved.

(43) We recommend that the possibilities of establishing industries subsidiary to Sugar Industry be investigated.

(44) We have examined the effects of protection on the revenues of the Central Government and find that the revenue from Customs duties on imported sugar is likely to decrease.

(45) The excise duty levied in 1934 to compensate for loss of customs revenue was not excessive but the additional excise duty levied in 1937, has had unfortunate consequences for the cane grower and manufacturer.

(46) At the prevailing level of prices we find that the present rate of excise duty is out of proportion.

(47) The manufacture of 'khandsari' sugar has continued to decline. A different method of levying excise duty is suggested.

(48) At the present level of prices palmyra sugar will cease to be manufactured if an excise duty is imposed. If the price of sugar rises this branch of the industry can bear an excise duty of 12 annas a maund.

(49) We doubt if a voluntary Selling Organisation will be able to control prices.

(50) We recommend the rationalisation of the Industry under some form of State control. For this purpose we suggest the convening of an all-India Conference representing all interests at an early date.

G. T. H. BRACKEN,

President.

FAZAL I. RAHIMTOOLA,

Member.

L. C. JAIN,

Member.

H. C. SEN,

Secretary.

CALCUTTA,

13th December, 1937.

APPENDIX A.

NOTE.—The costs of cultivation as given by cultivators selected as typical do not usually include repairs and renewals, interest on working capital or insurance. Costs per maund are not to be taken as average costs for any particular area.

The average cost figures given in the body of the Report include repairs and renewals, interest on working capital and insurance and are calculated on the basis of the figures given by all the cultivators examined whose cost estimates were accepted as reasonably accurate.

		Cost of cultivation per acre.
<i>United Provinces—Gorakhpore District.</i>		
		Rs. A. P.
1. Trenching		10 0 0
2. Manure, sulphate of ammonia		18 8 8
3. Neem cake		10 12 7
4. Cane seed		7 9 5
5. Cost of irrigation, crude oil and mobil oil		18 11 1
6. Labour (excluding cost of trenching)		19 1 6
7. Cartage		24 11 10
8. Cost of harvesting and stripping		12 14 11
9. Rent		12 0 0
10. Farm salaries		21 0 0
11. Cost of oil cake for bullocks		2 10 10
12. Interest on capital outlay		20 7 10
Total		178 8 8

Yield per acre 811 maunds 37 seers.

Cost per maund of cane Re. 0-3-6.

<i>United Provinces—Gorakhpore District.</i>		
1. Trenching		11 0 0
2. Manure, sulphate of ammonia		20 1 4
3. Cost of irrigation, crude oil and mobil oil		6 8 0
4. Labour (excluding cost of trenching)		20 6 4
5. Cartage		18 3 4
6. Cost of harvesting and stripping cane		10 4 11
7. Cane seed		5 12 9
8. Rent		12 0 0
9. Farm salaries		14 4 8
10. Cost of oil cake for bullocks		4 12 4
11. Interest on capital outlay		19 8 10
Total		142 14 6

Yield per acre 620 maunds 17 seers.

Cost per maund of cane Re. 0-3-7.

Cost of cultivation
per acre.

United Provinces—Bilari District.

	Rs.	A.	P.
1. Cultivation charges	5	7	6
2. Cost of manure and manuring	22	0	3
3. Cost of seed and sowing	15	14	0
4. Irrigation	13	10	2
5. Hoeing and earthing	9	9	4
6. Rent	20	0	0
7. Harvesting	0	12	8
8. Carting	4	11	1
9. Overhead charges	7	4	4
10. Other expenses	1	12	10
11. Dept. charges on bullocks, building, and tube-well	15	13	4
Total	121	15	6

Yield per acre 441 maunds.

Cost per maund of cane Rs. 0-4-5.

United Provinces—Meerut Division.

1. Green Manure	8	10	0
2. Manuring	25	0	0
3. 6 ploughings	7	8	0
4. Sowing	1	8	0
5. Irrigation	4	11	0
6. Seeds	15	10	0
7. Interculture	3	12	0
8. Earthing up	2	8	0
9. Binding	3	12	0
10. Rent	16	0	0
11. Supervision	10	0	0
12. Cutting	12	9	0
Total	111	8	0

Yield per acre 603 maunds.

Cost per maund of cane Re. 0-2-11.

United Provinces—Dehra Dun District.

1. Tilling 8 times	13	12	0
2. Preparing nursery including hang	5	0	0
3. Manure 5 carts	25	0	0
4. Spreading manure	1	9	0
5. Seed price	25	0	0
6. Cutting seed carting and planting	5	0	0
7. Weeding 3 times	15	0	0
8. Levelling nurseries	2	8	0
9. Earthing	10	0	0
10. Watching	5	0	0

Cost of cultivation
per acre.*United Provinces—Dehra Dun District—contd.*

	Rs.	A.	P.
11. Watering 8 times	2	8	0
12. Land rent	30	0	0
13. Water rent	10	0	0
Total	150	5	0

Yield per acre 500 maunds.

Cost per maund of cane Re. 0-4-10.

Bihar—Hajipur District.

1. Tamni—digging	5	8	0
2. Ploughing and levelling 4 times before October	4	6	5
3. Manure cost 20 carts cow dung and transport .	27	8	0
4. (a) Spreading of manure—coolly 4	1	1	7
(b) Ploughing	1	1	7
5. Furrowing	1	1	7
6. Seed (cost) 40 and transport	17	9	7
7. Disinfecting seed with coal tar	2	3	2
8. Planting 4 and levelling	1	10	5
9. Weeding twice	4	6	5
10. Tamni	2	3	2
11. Earthing twice	1	10	5
12. Rent for 2 years	5	8	0
13. Harvesting	11	0	0
Total	86	14	4

Yield per acre 500 maunds.

Cost per maund of cane Re. 0-2-9.

Bihar—Darbhanga District.

1. Ploughing with country ploughs	10	0	0
2. Trench cutting	7	0	0
3. Manuring	15	0	0
4. Sowing and dressing the trenches	2	0	0
5. Earthing	2	0	0
6. Seeds with carting	15	0	0
7. Rent for 2 years	10	0	0
8. Cutting and cleaning cane for delivery to the mills or for crushing	4	0	0
9. Spading and taking out cane roots after cane is cut	4	0	0
Total	69	0	0

Yield per acre 300 maunds.

Cost per maund of cane Re. 0-3-8.

Type of cane Co.213.

Cost of cultivation
per acre.

Bihar—Muzaffarpur District.

	Rs.	A.	P.
1. 8 ploughings at 8 annas per ploughing	4	0	0
2. 1 maund green manure	3	12	0
3. 3 ploughings for green manure	1	12	0
4. 10 ploughings before planting	5	0	0
5. 30 cartloads of farmyard manure	15	0	0
6. Ploughing after manure	2	0	0
7. Trenching and levelling	0	12	0
8. Preparation and planting of seed	1	0	0
9. Ploughing (Harrowing)	0	8	0
10. Earthing up	0	4	0
11. 2 years rent	10	0	0
12. Harvesting, cutting and loading	5	10	0
13. Seed 40 maunds at 5 annas	12	8	0
14. Watching	7	8	0
Total	69	10	0

Yield per acre 400 maunds.

Cost per maund of cane Re. 0-2-9.

Bihar—Champan District.

1. Ploughing	5	8	0
2. Harrowing	2	0	0
3. Manure	6	0	0
4. Cartage for manure	3	0	0
5. Labour charge for spreading the manure	1	0	0
6. Seed at As. 4-9 per maund 1 katha= 2½ maunds	18	2	0
7. Labour engage for sowing	1	2	0
8. Weeding and Ryding	5	0	0
9. Cartage for carrying cane to weighbridge	13	12	0
10. Scruping of cane at the time of harvesting	2	0	0
11. Interest on advance taken by cultivator	10	11	0
12. Rent	3	0	0
13. Supervision	5	0	0
14. Watching charge	2	0	0
Total	78	3	0

Yield per acre 300 maunds.

Cost per maund of cane Re. 0-4-2.

Punjab—Lahore District.

(Cost given by three cultivators.)

1. Land rent	50	0	0
2. Preparation of land	10	0	0
3. Seed	20	0	0

Cost of cultivation
per acre.

Punjab—Lahore District—contd.

	Rs.	A.	P.
4. Hoeing	10	0	0
5. Irrigation	80	0	0
6. Manure	20	0	0
Total .	190	0	0

Yield per acre 600 maunds.

Cost per maund of cane Re. 0-5-1.

Bengal—Murshidabad District.

1. Ploughing	9	0	0
2. Trenching	22	8	0
3. 3 diggings at Rs. 6	18	0	0
4. One weeding	6	0	0
5. Cutting seed, carting and cutting into sections and applying coal tar	2	12	0
6. Planting and applying nicifos	3	12	0
7. Watering and applying disinfectant	2	4	0
8. Applying ammonia	1	8	0
9. Price of coal tar	2	0	0
10. Price of disinfectant	1	0	0
11. Price of nicifos	9	6	0
12. Price of sulphate of ammonia	13	0	0
13. Price of seed (one acre will plant not less than 12 acres and often more if the cane is good)	10	0	0
14. Rent 1½ years at Rs. 3	4	8	0
15. Cane cutting	12	0	0
Total .	117	10	0

Yield per acre 750 maunds.

Cost per maund of cane Re. 0-2-6.

Type of cane Co.213, 243, 270.

Bengal—Raishahi District.

Year.	Tillage.	Insect pest.	Trench.	Applica- tion of manure.	Planting.	Hoing and weed- ing.	Plough- ing for weeding.	Earthing.	Thrashing.	Harvest- ing.	Cutting.	Cost of manure.	Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1933-34 . .	5 0 3	..	17 10 9	3 3 9	7 14 9	0 13 6	..	3 12 0	3 13 6	24 0 0	10 5 9	15 0 0	92 3 3
1934-35 . .	6 15 0	0 14 3	0 6 0	2 13 0	6 8 3	5 15 3	..	0 10 6	10 11 3	24 2 3	13 12 0	5 4 0	87 14 9
1935-36 . .	6 5 3	0 7 6	0 3 3	2 14 6	8 1 0	6 6 0	1 8 9	1 5 0	..	23 10 9	13 8 9	11 4 0	96 11 3
1936-37 . .	6 6 9	0 14 6	0 11 3	0 13 6	5 10 0	2 8 6	..	0 6 9	3 9 0	16 10 3	14 10 0	10 2 0	92 6 6

Yield per acre 368 maunds. Cost per maund of cane Rs. 0-2-8. Type of cane Co. 213.

Cost of cultivation
per acre.*Bengal—Rajshahi District.*

	Rs. A. P.	Rs. A. P.
1. Ploughing	12 0 0	
Harrowing	6 0 0	
Laddering	1 8 0	
	<hr/>	19 8 0
2. Trenching by ridger . .	6 0 0	
Spreading	4 8 0	
	<hr/>	10 8 0
3. Cutting setts	14 4 0	
Planting	9 0 0	
	<hr/>	23 4 0
4. Manuring	15 0 0	
Applying manure	4 8 0	
	<hr/>	19 8 0
5. Harrowing for interim cultivation	6 0 0	
Earthing by meddle breaker	6 0 0	
	<hr/>	12 0 0
6. Weedings		9 0 0
7. Harvesting and dressing .		22 8 0
8. Carting to the cane centre .		25 5 0
9. Rent		6 0 0
10. Sundries neem oil cake .		4 8 0
		<hr/>
Total		152 1 0

Yield per acre 540 maunds.

Cost per maund of cane Re. 0-4-6.

Bombay—Ahmednagar District.

1. Manuring with green manure	25 0 0
2. Ploughing	20 0 0
3. Farmyard manure (15 carts at Rs. 2 per cart)	30 0 0
4. Planting	14 0 0
5. Setts 10,000	30 0 0
6. Weeding	10 0 0
7. Ammonium sulphate 2 bags	22 0 0
8. Oilcake 14 pallas at Rs. 6-8 a palla . .	91 0 0
9. Cost of earthing up	12 0 0
10. Labour for spreading manure and top dressing	6 0 0
11. Waterman (no watching required) . .	20 0 0
12. Supervision	15 0 0
13. Rental for one year	30 0 0

		Cost of cultivation per acre.		
<i>Bombay—Ahmednagar District—contd.</i>		Rs. A. P.		
14. Irrigation charges for 15 months (including local cess Rs. 4)		64	0	0
15. Cost of cutting		18	0	0
Total		407	0	0

Yield per acre 40 to 50 tons or 1,225 maunds.

Cost per maund of cane Re. 0-5-4.

Type of cane Co.416, 360 and E.K. and P.O.J. varieties.

<i>Bombay—Poona District.</i>				
1. Ploughing and furrowing		20	0	0
2. Green manure or in the alternative farmyard manure—20 carts at Rs. 2 a cart		40	0	0
3. 10,000 setts of cane at Rs. 3 per 1,000 setts		30	0	0
4. Binding, manuring and planting		15	0	0
5. Six weedings		15	0	0
6. Top dressing, earthing up, and tethering (stirring soil)		15	0	0
7. Ammonium sulphate two bags each of 2 cwts.		24	0	0
8. $\frac{1}{2}$ ton ground nut cake and 1 ton castor cake		88	0	0
9. Waterman and watching (1 man for 5 acres)		30	0	0
10. Rent of land		20	0	0
11. Irrigation cess (1 anna per rupee) and overlap		60	0	0
12. Add interest on 300 for 12 months at 12 per cent. per annum		36	0	0
13. Harvesting		18	0	0
Total		411	0	0

Yield per acre 40 tons or 1,089 maunds.

Cost per maund of cane Re. 0-6-0.

Type of cane E.K.28 and P.O.J.2878.

NOTE.—Average yield in 1937 was 50—63 tons for Adsali crop (18 months) and 45 tons for one year crop.

<i>Madras—Cuddalore District.</i>				
1. Preparatory		15	0	0
2. Seed		27	0	0
3. Sowing		4	0	0
4. Interculture		20	0	0
5. Fertilizer		64	0	0
6. Rent		30	0	0 (Estimated)
7. Irrigation from tube-well		70	0	0
8. Harvesting		18	0	0
Total		248	0	0

Yield per acre 953 maunds.

Cost per maund of cane Re. 0-4-2.

Cost of cultivation
per acre.*Madras—Vizagapatam District.*

Rs. A. P.

Preparatory Cultivation—

1. 1st ploughing with country plough . .	3	3	0
2. 2nd ploughing with country plough . .	2	2	0
3. Patti	0	4	3
4. Guntaka	0	8	6
5. 3rd ploughing with country plough . .	1	9	6
6. Patti	0	4	3
7. Guntaka	0	8	6
8. 4th ploughing covering manure	1	9	6
9. Digging headlands	1	4	0
10. Forming furrows	1	1	0
11. Forming irrigation channels and rectifying furrows at headlands	1	4	0
Total . .	13	10	6

Manures and manuring—

1. Transporting 20 carts of F.Y.M. and spreading	3	3	6
2. Cost of 20 carts F.Y.M.	10	0	0
3. Sheep penning	15	0	0
4. Ammonium sulphate 2 bags at Rs. 4 each .	8	0	0
5. Application of ammonium sulphate . .	1	14	0
Total . .	33	1	6

Seeds and sowing—

1. Preparation of seed from 10 cwts. or about 5,000 lbs.	4	11	0
2. Distribution of setts and planting	2	0	6
3. Irrigation by mhote	5	8	0
4. Cost of 10 candies seed at Rs. 2-8-0 per candy	25	0	0
Total . .	37	3	6

Irrigation—

1. March—1 irrigation	5	8	0
2. April, May and June—2 irrigations each month	33	0	0
3. December and January—irrigation in each month	11	0	0
Total . .	49	8	0

Cost of cultivation
per acre.

Madras—Vizagapatam District—contd.

	Rs	A	P
After cultivation—			
1. 1st hoeing in March	3	2	0
2. 2nd hoeing in April	3	14	6
3. May-June earthing up	7	13	0
4. June-July 1st wrapping	4	11	0
5. August 2nd wrapping	6	4	0
6. September 3rd wrapping	7	13	0
7. November 4th wrapping	9	6	0
8. January 5th wrapping	9	6	0
9. November and December—removal and side- shorts	1	14	0
10. Fixing 3,000 bamboos	3	2	0
11. Cost of 3,000 bamboos at Rs. 3 per 100. $\frac{1}{2}$ cost is debited for each year	30	0	0
Total	87	5	6

Harvesting—

1. Harvesting, stripping, tapping, etc.	43	12	0
2. Rent of land	40	0	0
Total	309	9	0

Yield per acre 40 tons=1,089 maunds.

Cost per maund of cane Re. 0-4-7.

Type of cane J.247

1. Acre 2-0 of J.247 with lift irrigation, wrapping and propping—			
(a) Preparing the land	2	5	6
(b) Manuring the land (sheep manure and chemical manure)	42	7	3
(c) Planting the seed material	11	3	0
(d) Subsequent irrigation, wrapping, prop- ping, etc.	178	13	0
(e) Rent of land at Rs. 40 per acre	80	0	0
(f) Depreciation of ploughing bulls of Rs. 16 per acre	232	0	0
(g) Cutting and preparing the sugar cane and delivery at the factory excluding cart hire which is included in depreciation of bulls	26	4	0
Total	373	0	9

The yield of cane being 70 tons for 2 acres the
average cost per ton of cane is Rs. 5-5-3
or Re. 0-3-1 per maund.

Cost of cultivation
per acre.*Madras—Vizagapatam District—contd.*

	Rs.	A.	P.
2. Another item of acres 2 consisting of Co.281 and J.247—			
(a) Preparing the land	6	7	0
(b) Manuring the land (cattle manure and chemical manure)	56	15	9
(c) Planting the seed material	2	13	6
(d) Subsequent irrigation, wrapping and proping, etc.	139	2	0
(e) Rent of land at Rs. 40 per acre	80	0	0
(f) Depreciation of ploughing bulls, etc., at Rs. 16 per acre	32	0	0
(g) Cutting and preparing the sugarcane and delivery at the factory	26	4	0
Total	343	10	3

The yield of cane being 70 tons for 2 acres the average cost per ton of cane is Rs. 4-14-6 or Re. 0-3-6 per maund.

3. Cultivation of J.247, area being acres 2-50—			
(a) Preparing the land	26	7	6
(b) Manuring the land (cattle manure and chemical manure)	75	6	3
(c) Planting the seed material	23	7	0
(d) Subsequent irrigation, wrapping, proping, etc.	225	12	0
(e) Rent of land at Rs. 40 per acre	100	0	0
(f) Depreciation of ploughing bulls, etc.	40	0	0
(g) Cutting and preparing the sugarcane and delivery at the factory excluding cart hire which is included in depreciation of ploughing bulls	32	10	0
Total	523	10	9

The total yield being 87 tons, the cost of cultivation per ton of cane is Rs. 6-0-3 or Re. 0-3-6 per maund.

4. Co.281 and J.247, area being acres 2-0—			
(a) Preparing the land	2	6	6
(b) Manuring the land (sheep manure and chemical manure)	46	5	6
(c) Planting the seed material	10	14	6
(d) Subsequent irrigation, wrapping and proping, etc.	171	0	9
(e) Rent of land at Rs. 40 per acre	80	0	0
(f) Depreciation of ploughing bulls, etc., at Rs. 16 per acre	32	0	0

APPENDIX.

Cost of cultivation
per acre.

Madras—Vizagapatam District—contd.

Rs. A. P.

(g) Cutting and preparing the sugarcane and delivery at the factory excluding cart hire which is included in depreciation of ploughing bulls	26	4	0
Total	368	15	3

The total yield being 70 tons and the cost of cultivation per ton of cane is Rs. 5-3-2 or Re. 0-3-1 per maund.

5. Co.313 and 243, area being acres 2-50—			
(a) Preparing the land	3	14	0
(b) Manuring the land (sheep manure and chemical manure)	53	13	0
(c) Planting the seed material	22	11	6
(d) Subsequent irrigation, wrapping and propping	90	10	0
(e) Rent of land at Rs. 40 per acre	100	0	0
(f) Depreciation of ploughing bulls, etc. at Rs. 16 per acre	40	0	0
(g) Cutting and preparing the sugarcane and delivery at the factory excluding cart hire which is included in depreciation of ploughing bulls	32	10	0
Total	343	10	6

The total yield being 87 tons of cane and the cost of cultivation per ton of cane is Rs. 3-15-3 or Re. 0-2-4 per maund.

6. Cultivation of Co.213, the area being acres 6-50—			
(a) Preparing the land	13	15	0
(b) Manuring the land (cattle manure and chemical manure)	139	10	0
(c) Planting the seed material	32	1	6
(d) Subsequent irrigation, wrapping, propping, etc.	149	5	6
(e) Rent of land at Rs. 40 per acre	260	0	0
(f) Depreciation of ploughing bulls at Rs. 16 per acre	104	0	0
(g) Cutting and preparing the sugarcane and delivery at the factory excluding cart hire which is included in depreciation of ploughing bulls	79	3	6
Total	778	3	6

The total yield being 169 tons and the cost of cultivation per ton of cane is Rs. 4-9-6 or Re. 0-2-8 per maund.

Cost of cultivation
per acre.

Madras—Vizagapatam District—concl'd.

	Rs.	A.	P.
7. Co.213, area being 4.50 acres—			
(a) Preparing the land . . . . .	...	
(b) Manuring the land (sheep manure and chemical manure)	96	6	6
(c) Planting the seed material	39	7	3
(d) Subsequent irrigation, wrapping and propping, etc.	45	11	0
(e) Rent of land at Rs. 40 per acre	180	0	0
(f) Depreciation of ploughing bulls, etc., at Rs. 16 per acre	72	0	0
(g) Cutting and preparing the sugarcane and delivery at factory excluding cart hire which is included in depreciation of ploughing bulls	54	13	6
Total	488	6	3

The total yield being 117 tons and the cost of cultivation per ton of cane is Rs. 4-2-10 or Re. 0-2-5 per maund.

8. Co.213, area being acres 1.50—			
(a) Preparing the land	7	10	0
(b) Manuring the land (sheep manure and chemical manure)	32	2	0
(c) Planting the seed material	3	8	3
(d) Subsequent irrigation, propping and wrapping	35	8	3
(e) Rent of land at Rs. 40 per acre	60	0	0
(f) Depreciation of ploughing bulls at Rs. 16 per acre	24	0	0
(g) Cutting and preparing the sugarcane and delivery at the factory excluding cart hire which is included in depreciation of ploughing bulls	18	12	0
Total	181	8	6

The total yield of cane being 40 tons and the cost of cultivation per ton of cane is Rs. 4-8-7 or Re. 0-2-8 per maund.

APPENDIX B.

A note on the improvement in extraction and recovery during the three seasons ending 1936-37, and the portions thereof due to better cane and better efficiency, dated 28th November, 1937, by Mr. R. C. Srivastava, Director, Imperial Institute of Sugar Technology, India, Cawnpore.

It is well known that these figures depend on the quality of cane and on the efficiency of the milling and manufacturing operations. The figures for recovery and extraction under reference show that the composition of cane and extraction have both altered. The present note concerns with apportioning the above improvement into—

- (i) The improvement in milling and boiling house extractions, as well as in recovery of sugar per cent. cane, resulting from quality of cane;
- (ii) The improvement in milling and boiling house extractions, as well as in recovery resulting from increased technical efficiency.

Mill-extraction.—The figures relating to the increase or decrease in mill-extraction, with reference to cane quality and milling efficiency are given in Table I for three years.

From the figures it will be observed that the quality of cane has been deteriorating so far as milling extraction is concerned. The increase in fibre content in cane diminishes the milling value of the cane and this had an adverse effect on mill-extraction. The increase in the average fibre content in cane is to some extent due to increase in the area under ratoon cane and to the crushing of over-ripe cane at the end, due to a longer crushing season. This adverse effect is, however, greatly minimised, as a result of the increase efficiency of the milling operation. Thus all the provinces except the Punjab, Bengal and Madras, even registered an increase in extraction, in spite of the adverse effect due to increased fibre content. It will further be observed, that the milling efficiency has increased in all the provinces in 1936-37 except in Madras.

The effect of the quality of cane on mill-extraction has been at a maximum in the Punjab (2.68 in 1935-36 and 2.05 in 1936-37) followed by Madras (1.92) and Bengal (1.91) in 1935-36, and by Madras (1.88), Bengal (1.83) and West United Provinces (1.34) in 1936-37. There has been only one case, where the quality of cane has improved from the point of view of milling, and that is in East United Provinces in (1935-36). But this is not kept up in 1936-37, due perhaps to ratoon cane and longer season.

The increase in mill-extraction due to improvement in milling efficiency has been maximum in the Punjab (2.05) followed by West United Provinces (1.27) and East United Provinces (1.09) in 1935-36, while the 1936-37 this is shown by East United Provinces (2.75), closely followed by South Bihar (2.60).

The largest increase in mill-extraction as a combined result of quality of cane and efficiency has been in East United Provinces both in 1935-36 and 1936-37, being 1.32 and 2.22 units respectively. The mill-extraction has decreased to a maximum of 2.17 units in Bengal in 1935-36 and of 2.06 units in Madras in 1936-37.

Boiling House Extraction.—The figures relating to boiling house extraction are given in Table II. It will be observed from the figures given in the table that the effect of the variation in the quality of cane on the boiling house extraction was not as uniform as was the case with mill-extraction.

The increase in boiling house extraction due to better quality cane was highest in the Punjab and West United Provinces, in both years 1935-36 and

1936-37. It is very necessary to point out in this connection however that this was not due to these parts having produced much better cane than the others, but was due to the very poor quality cane obtained in these parts in 1934-35, with which the figures for the subsequent years are being compared.

Excluding therefore the Punjab and West United Provinces the maximum increase in boiling house extraction due to better quality cane has been in Bombay (2.36 units) in 1935-36, and in Bengal (3.71 units) in 1936-37. The quality of cane had the maximum adverse effect on boiling house extraction in North Bihar (2.56) and Central United Provinces (2.34) in 1935-36, and in North Bihar (7.08) in 1936-37.

The maximum increase in boiling house extraction due to improvement in boiling house efficiency is shown in North Bihar, the increase being 5.10 and 10.59 units in 1935-36 and 1936-37 respectively. North Bihar is followed by the Punjab recording an increase in boiling house extraction of 4.68 and 9.20 units in 1935-36 and 1936-37 respectively. The boiling house efficiency decreased to the greatest extent in Bombay and Baroda in 1935-36, the decrease being 2.66 units, while in 1936-37, this portion was taken by Madras with a decrease of 1.88 units.

The increase in boiling house extraction resulting from the combined effect of the quality of cane and efficiency, excluding however, the Punjab and West United Provinces (for reasons already stated), has been maximum in North Bihar (2.54 units) in 1935-36, and in 1936-37 in Bengal (5.93 units) followed by North Bihar (3.51 units).

Recovery of Sugar per cent. Cane.—Figures relating to the increase or decrease in recovery, and the portions thereof due to quality of cane and due to efficiency are given in Tables III, IV and V.

The greatest increase in recovery has been recorded by the Punjab, which is closely followed by West United Provinces, in both the years 1935-36 and 1936-37. This, however, as already explained has not been the result of a much superior cane quality or efficiency, but to a great extent due to the conditions having come to the normal from the highly sub-normal conditions that existed in these parts in the year 1934-35.

Excluding the Punjab and West United Provinces increases in recoveries are recorded by North Bihar (0.56; 0.54), East United Provinces (0.49; 0.86) and Bengal (0.03; 0.53) in 1935-36 and 1936-37, and also in South Bihar (0.41) and Central United Provinces (0.45) in 1936-37. Bombay and Madras have shown a decrease in average recovery during these years. This is to some extent due to the smaller units that have been introduced in those Provinces. East United Provinces and North Bihar have however shown a steady increase in recovery.

The average percentage of the increase in recovery due to cane quality has been highest in West United Provinces (89.42 per cent.) and next in the Punjab (64.57 per cent.). This high contribution towards the percentage of the increase in recovery by cane quality is only apparent for reasons already stated.

Excluding the Punjab and West United Provinces the percentage of the increase in recovery due to better quality cane has been highest in Bengal (58.93), which is followed by East United Provinces (43.7 per cent.). The quality of cane had a decidedly adverse effect on the increase in recovery in Bombay, South Bihar and North Bihar. This adverse effect has been compensated for by better efficiency in North and South Bihar and the increase in recovery should have been much higher due to improved efficiency, if the average cane quality cane had not decreased.

In Bombay, though the efficiency has considerably improved, the adverse effect of cane quality has been too high and consequently there is a decrease in recovery in spite of better efficiency. In Madras, on the other hand, the quality of cane has slightly improved and this should have given an increased recovery, but actually the recovery per cent. has decreased due

to decrease in efficiency. This however may to some extent be due to the addition of less efficient units, rather than the decrease in the efficiency of the old units.

Conclusion.—The analysis of the increase in recovery has clearly shown that the greater portion of the increase in recovery is due to increased efficiency, rather than better cane quality. The increased efficiency has almost in all the provinces a greater share of the increase in recovery (excluding the Punjab and West United Provinces for reasons explained already).

The quality of cane has not improved to the extent it should have, and has actually declined in Bombay, North Bihar and South Bihar. To some extent increases under ratoon cane and the longer seasons have been responsible for this diminution in the average cane quality. In Bombay, the improvement in efficiency has not been able to make this up and a decrease in recovery has resulted. In Bihar, on the other hand, the increase in efficiency has been able to make up for this and an increase in recovery has taken place. If the cane quality had at least been the same as before, the increase in recovery would have been much higher in Bihar, due to efficiency alone.

TABLE I.—*Showing increase or decrease in milling extraction separately due to (i) quality of cane, (ii) milling efficiency and (iii) total from the season 1934-35 to seasons 1935-36 and 1936-37.*

Serial No.	Groups.	SEASON 1934-35.					SEASON 1935-36.					SEASON 1936-37.				
		Fibre per cent. cane.	Actual mill extraction.	Fibre per cent. cane.	Calculated mill-extraction.	Increase or decrease in mill-extraction due to quality of cane.	Actual mill-extraction.	Increase or decrease in mill-extraction due to milling efficiency.	Total increase or decrease in mill-extraction.	Fibre per cent. cane.	Calculated mill-extraction.	Increase or decrease in mill-extraction due to quality of cane.	Actual mill-extraction.	Increase or decrease in mill-extraction due to milling efficiency.	Total increase or decrease in mill-extraction.	
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	
1	Punjab	13.74	89.79	15.97	87.11	-2.68	89.16	2.05	-0.63	15.03	87.86	-1.03	89.32	1.46	-0.47	
2	Western United Provinces	14.06	89.87	15.06	89.01	-0.86	90.28	1.27	0.41	15.63	88.53	-1.34	90.39	1.86	0.62	
3	Central United Provinces	15.27	91.04	16.50	90.05	-0.99	90.43	0.83	-0.61	16.02	90.61	-0.43	91.63	1.02	0.60	
4	Eastern United Provinces	15.74	88.75	15.46	88.98	0.23	90.07	1.09	1.82	16.36	88.22	-0.53	90.97	2.75	2.22	
5	North Bihar	16.15	91.12	16.72	91.03	-0.09	91.63	0.60	0.51	16.80	90.69	-0.43	91.76	1.07	0.64	
6	South Bihar	16.69	89.12	16.72	89.09	-0.03	89.01	-0.08	-0.11	17.04	88.13	-0.99	90.79	2.66	1.67	
7	Bengal	14.68	90.72	17.19	88.81	-1.41	88.55	-0.26	-2.17	17.07	88.80	-1.83	89.58	0.69	-1.14	
8	Madras	10.21	94.16	13.10	92.24	-1.92	92.64	0.32	-1.60	13.04	92.28	-1.88	92.10	-0.13	-2.06	
9	Bombay and Baroda	16.88	89.15	14.62	88.47	-0.98	89.44	0.97	0.20	14.50	88.58	-0.57	90.23	1.65	1.08	
10	Mysore . . . . .	..	..	12.89	..	..	90.71	..	..	..	..	..	..	..	..

TABLE II.—Showing increase or decrease in boiling house extraction due to (i) quality of cane, (ii) boiling house efficiency and (iii) total from the season 1934-35 to seasons 1935-36 and 1936-37.

Serial No.	Groups.	SEASON 1934-35.				SEASON 1935-36.				SEASON 1936-37.								
		Mixed juice purity.	(A)	Actual boiling house extraction.	Mixed juice purity.	(B)	Increase or decrease in B. H. E. due to quality of cane.	(C)	Actual boiling house extraction.	(C-B)	Increase or decrease in B. H. E. due to efficiency in B. H.	Total increase or decrease in B. H. extraction.	Mixed juice purity.	(B ₁)	Increase or decrease in B. H. E. due to quality of cane.	(C ₁)	Actual boiling house extraction.	(C ₁ -B ₁)	Increase or decrease in B. H. E. due to efficiency in B. H.	Total increase or decrease in B. H. extraction.
1	Punjab	72-49	73-82	75-43	77-45	3-63	82-13	4-68	8-31	77-83	79-64	5-82	88-64	9-20	15-02			
2	Western United Provinces	73-84	82-23	77-49	85-43	3-20	87-22	1-70	4-99	79-69	87-22	4-99	88-23	1-06	6-05			
3	Central United Provinces	81-46	86-26	78-96	89-92	-2-34	85-42	1-50	-0-84	82-13	86-88	0-62	86-66	-0-22	0-40			
4	Eastern United Provinces	81-57	86-85	81-26	86-58	-0-27	88-19	1-61	1-84	82-03	87-25	0-40	88-92	1-67	2-07			
5	North Bihar	84-42	83-90	82-36	81-34	-2-56	86-44	5-10	2-54	79-00	76-82	-7-08	87-41	10-59	3-51			
6	South Bihar	80-12	87-26	78-37	85-32	-1-44	87-95	2-13	0-69	79-91	87-09	-0-17	87-62	0-43	0-26			
7	Bengal	75-29	82-25	75-01	81-98	-0-27	81-81	-0-17	-0-44	79-40	85-96	3-71	88-18	2-22	5-93			
8	Madras	79-80	83-83	80-53	84-56	0-73	83-83	-0-73	0-00	80-55	84-53	0-75	82-70	-1-88	-1-13			
9	Bombay and Baroda	84-24	88-07	81-68	85-71	2-36	83-37	-2-66	-0-30	83-56	87-45	-0-62	90-23	1-78	1-16			
10	Mysore . . . . .	..	..	84-60	..	..	85-73	..	..	..	..	..	..	..	..

TABLE III.—*Showing increase or decrease in sugar recovery separately due to (i) quality of cane and (ii) overall efficiency from the season 1934-35 to seasons 1935-36 and 1936-37.*

Serial No	Groups.	SEASON 1934-35.			SEASON 1935-36.						SEASON 1936-37.					
		Sugar per cent. cane.	Actual overall results.	Sugar recovery per cent. cane.	Sugar per cent. cane.	Calculated overall recovery due to cane quality.	Calculated recovery after allowing for cane quality.	Increase or decrease in recovery due to cane quality.	Actual recovery of Sugar per cent. cane.	Increase or decrease in recovery due to overall efficiency.	Sugar per cent. cane.	Calculated overall recovery due to cane quality.	Calculated recovery after allowing for cane quality.	Increase or decrease in recovery due to cane quality.	Actual recovery of sugar per cent. cane.	Increase or decrease in recovery due to overall efficiency.
1	Punjab . . .	8.96	66.80	(M)	10.63	67.47	7.17	1.13	7.80	0.03	10.98	69.97	7.68	1.69	8.68	0.95
2	Western United Pro- vinces.	9.01	73.90	7.06	11.39	76.04	8.06	1.00	8.84	0.13	11.88	77.20	9.17	2.11	9.43	0.26
3	Central United Pro- vinces.	11.81	78.64	9.25	11.91	76.67	9.00	-0.25	9.15	0.15	12.16	78.72	9.67	0.32	9.70	0.13
4	Eastern United Pro- vinces.	11.72	77.07	9.07	12.05	77.04	9.23	0.21	9.56	0.23	12.28	76.97	9.45	0.33	9.93	0.48
5	North Bihar . .	11.28	76.45	8.92	11.69	74.04	8.68	-0.04	9.13	0.60	11.42	69.67	7.96	-0.66	9.16	1.20
6	South Bihar . .	11.61	77.77	9.03	11.33	76.46	8.66	-0.37	8.87	0.21	11.88	76.75	9.12	0.09	9.44	0.32
7	Bengal . . .	11.27	74.12	8.15	11.29	72.81	8.22	0.07	8.13	-0.04	11.00	76.41	8.41	0.26	8.68	0.27
8	Madras . . .	11.73	78.94	9.80	11.90	78.00	9.23	-0.02	9.21	-0.07	11.97	78.05	9.34	0.04	9.12	-0.22
9	Bombay and Baroda	13.80	78.61	10.90	13.14	75.83	9.96	-0.94	10.40	0.44	13.27	77.46	10.23	-0.92	10.84	0.56
10	Mysore . . .	..	..	..	13.13	..	..	..	10.25	..	..	..	..	..	..	..

TABLE IV.—Showing total increase or decrease in recovery of sugar for the seasons 1935-36 and 1936-37 over the season 1934-35.

Serial No.	Groups.	Sugar recovery per cent. cane for the season 1934-35	SEASON 1935-36.		SEASON 1936-37.	
			Sugar recovery per cent. cane for the season 1935-36.	Total increase or decrease in recovery over 1934-35.	Sugar recovery per cent. cane for the season 1936-37.	Total increase or decrease in recovery over 1934-35.
1	Punjab	5.09	7.80	1.81	8.63	2.64
2	West United Provinces	7.06	8.94	1.78	9.43	2.37
3	Central United Provinces	9.25	9.15	0.10	9.70	0.45
4	East United Provinces	9.07	9.56	0.49	99.3	0.86
5	North Bihar	8.62	9.18	0.56	9.10	0.54
6	South Bihar	9.03	8.87	-0.16	9.44	0.41
7	Bengal	8.15	8.18	0.03	8.68	0.53
8	Madras	9.30	9.21	-0.09	9.12	-0.18
9	Bombay and Baroda	10.90	10.40	-0.50	10.84	-0.06
10	Mysore . . . . .	..	10.25	..	..	..

APPENDIX C.

Manufacturing expenses of a 500-ton sugar factory crushing for 130 days, working for 22 hours per day, with 9·5 per cent. recovery of sugar.

	As. P.	Rs. A. P.
<i>Manufacturing expenses—</i>		
Power and fuel	1	0
Stores (including other raw materials)	2	3
Repairs and renewals	2	3
(A) Salaries and wages—		
Technical staff	4	6
Non-technical staff	3	4
Labour	4	1
Packing (including cost of gunny bags)	2	3
Miscellaneous (water, lighting, etc.)	2	1
<i>Overhead Charges—</i>		
Depreciation		
Interest on working capital		
(B) Management expenses	1	9
Directors' and Auditors' fees (including travelling allowance)	0	5
Insurance	0	9
Rents, rates and taxes	0	5
Miscellaneous	0	7
Sales expenses	1	6
		0 5 5
Total	1	12 0

	Rs.	Cost per maund.	As.	P.	As.	P.
(A) I. <i>Technical Staff—</i>						
(a) Permanent	35,700	3	5			
(b) Seasonal	11,760	1	1			
	47,460				4	6
II. <i>Non-technical staff—</i>						
(a) Permanent office establishment	15,108	1	5			
(b) Seasonal clerks	5,862	0	7			
(c) Engineering Department	7,980	0	9			
(d) Skilled labour	6,630	0	7			
	35,580				3	4
III. <i>Labour—</i>						
(a) 500 men at Rs. 12 per month each for 6 months (working season)	36,000	3	5			

III. <i>Labour—contd.</i>	Rs.	Cost per maund.	
		As. P.	As. P.
(b) 100 men at Rs. 12 per month each for 6 months (seasonal labour—20 per cent. of the working season staff)	7,200	43,200	0 8
Total		1,26,240	

(B) Management expenses include commission of managing agents at the rate of $7\frac{1}{2}$ per cent. *plus* head office expenses.

DETAILS OF 'A'.

Technical Staff—Permanent.

No. of staff.	Designation.	Scale.		Average per month.
		Rs.	Rs.	
1	Manager	750—900	825	
1	Chief Chemist	500—700	600	
1	Chief Engineer	500—700	600	
1	Assistant Chief Engineer	200—250	225	
1	Assistant Chief Engineer	200—250	225	
3	Shift Engineers	100—150	375	
1	Cane Superintendent	100—150	125	
Total salaries per month				2,975
				or 35,700 per year

Technical Staff—Seasonal.

		Rs.	Rs.
3	Shift Chemists	100—150	375
1	Laboratory Chemist	125—175	150
6	Laboratory Chemists	70—90	480
1	Head Panman	200—300	250
3	Panmen	80—100	270
6	Assistant Panmen	50—70	360
1	Assistant Cane Superintendent	60—90	75
Total			1,960
		or Rs. 11,760 for six months.	

I. NON-TECHNICAL STAFF.

(a) *Permanent Office Establishment*

No. of staff.	Designation.	Scale.		per month
		Rs.	Rs.	
1	Office Superintendent	100—150	125	
1	Accountant	80—100	90	
1	Cashier	80—90	85	
1	Stenographer	80—90	85	

(a) *Permanent Office Establishment—contd.*

No. of staff.	Designation.	Scale.	Average per month.
		Rs.	Rs.
1	Record-keeper . . .	40—70	55
1	Despatch clerk . . .	40—60	50
1	Godown clerk . . .	50—70	60
1	Store-keeper . . .	50—60	55
1	Head Time-keeper . . .	50—70	60
6	Peons . . .	10—20	90
2	Head Watchmen . . .	15	30
1	Gardener . . .	20	20
5	Sweepers . . .	8—10	45
12	Chowkidars . . .	10—12	132
2	Assistant Gardeners . . .	10—12	22
1	Transport Superintendent	80—100	90
	Extra Clerks . . .	45—65	165

1,259

or Rs. 15,108 per annum.

(b) *Seasonal clerks.*

Serial No.	Designation.	Number re-quired.	Salary and Grade.	Cost during season (maximum).
			Rs.	Rs.
1.	Stores Clerks . . .	2	35—2½—45	540
2.	Assistants to Cashier . . .	3	35—2½—45	810
3.	Assistants to Time-keeper . . .	2	35—2½—45	540
4.	Weighbridge Clerks . . .	8	20—2½—30	1,440
5.	Cane Inspectors . . .	2	35—2½—45	540
6.	Cane Clerks in office . . .	4	35—2½—45	1,080
7.	Assistant Godown-keepers . . .	2	30—2½—40	480
8.	Seasonal Chowkidars . . .	6	10—1 —12	432
Total		29		5,862

(c) *Engineering Department—Permanent.*

Serial No.	Designation.	Number re-quired.	Salary.	Cost during the year.
			Rs.	Rs.
	(a) <i>Engineering.</i>			
1.	Foreman (workshop) . . .	1	50	600
2.	Mechanics	2	40	960
3.	Fitters, ordinary	4	25	1,200
4.	Turner Fitters	2	25	600
5.	Blacksmith	1	20	240
6.	Moulder	1	20	240
7.	Carpenters	2	25	600
8.	Engine drivers	3	30	1,080
9.	Foreman boilers	3	25	900
10.	Electricians	2	30	720

(c) *Engineering Department—Permanent—contd.*

Serial No.	Designation.	Number re- quired.	Salary. Rs.	Cost during the year. Rs.
(b) <i>Manufacturing and General.</i>				
11. Masons	. . . . .	2	25	600
12. Tailor	. . . . .	1	20	240
		<hr/>		
	Total	24		7,980

(d) *Skilled Labour.*(a) *Engineering.*

1. Fitters	. . . . .	9 (3 × 3)	25	1,350
2. Engine drivers	12 (4 × 3)	25	1,800
3. Mates	6 (2 × 3)	20	720

(b) *Manufacturing.*

4. Mates	20	20	2,400
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(c) *General.*

5. Mason's assistants	2	15	180
6. Carpenter's assistants	2	15	180

Total 51 6,630

1. Lime used at 0.25 per cent. on cane rate, As. 13 per maund.
2. Sulphur at 0.075 per cent. on cane rate, Rs. 4-8 per maund.
3. Press Cloth 0.15 per cent. on cane rate, Re. 1 per maund.
4. Lubricating oil 0.12 gallons at Rs. 1.12 per maund.
5. Firewood at 1 per cent. on cane rate, Rs. 24 per maund.
6. Coal at 0.75 per cent. on cane rate, Rs. 14 per ton.
7. Filtergur at 0.005 per cent. on cane rate, Rs. 14-1 per maund.
8. Sumazine at 0.004 lb. per 100 cane, Rs. 7-8 per lb.
9. Blankit at 0.0018 per 100 maunds cane, Rs. 41 per maund.
10. Washing Soda at 0.015 per cane, Rs. 12 per maund.
11. E. C. at 0.04 gallon per 100 cane, Rs. 2 per gallon.
12. Packing including the cost of gunny bags at As. 2-3 per maund of sugar.
13. Press cloth repairs at 0.023 per 100 maunds cane.

APPENDIX D.

Alcohol production from molasses in different countries given in Hectolitres at 100° Gay-Lussac (2 hectolitre = 220 gallons).

Countries.	Years.	Quantity of Alcohol produced from molasses.
Austria .	1932	135,460
Belgium .	1932	89,300
Bulgaria .	.	9,730
Czechoslovakia	1933	250,000
Denmark .	1932	18,942
England .	1932	500,000
Estonia .	1933	...
France .	1932-33	830,278
Germany .	1932	726,572
Hungary .	1929	140,000
Jugoslavia .	1931	118,000
Latvia .	1933	8,200
Luxemburg	1932-33	1,542
Philippines	1933	100,000
Poland .	1933	11,906
Rumania .	1933	90,700*
Sweden .	1933	91,500†
Switzerland	1932	3,283
United States	1933	1,822,000

* For the whole of the production, molasses and materials.

† For the whole of the production, beet roots and molasses.

